

**February 7, 2007**

**MEMORANDUM**

**UTAH DEPARTMENT OF TRANSPORTATION**

**TO:** Jim McMinimee, P.E., Chairman

**FROM:** Barry Axelrod  
Recorder, Standards Committee

**SUBJECT:** Standards Committee Meeting Minutes and Next Meeting

The next meeting has been scheduled for Thursday, February 22, 2007 at 8:00 a.m., in the main 1st floor conference room of the Rampton Complex.

<b>Item</b>	<b>Remarks</b>	<b>Sponsor</b>
1. Minutes of November 30, 2006	For approval	Barry Axelrod
2. Supplemental Specifications and Supplemental Drawings, ATMS area. See listing.	For approval	Erik Brondum Todd Mac Gillvray
3. Supplemental Specification 02765, Pavement Marking Paint (From Action Log)	For approval	Tim Biel Degen Lewis
4. Supplemental Specification 02754, Dowel Bar Retrofit and Supplemental Drawing PV 9, Dowel Bar Retrofit	For approval	Tim Biel Degen Lewis
5. Supplemental Drawing, PV 8, Rumble Strips Centerline Application and UDOT Policy 06C-17 Use of Rumble Strips draft (From Action Log)	For approval	Robert Hull John Leonard
6. Supplemental Specification 02843, Crash Cushion (From Action Log)	For approval	Glenn Schulte
7. Supplemental Specification 02892, Traffic Signal and Supplemental Drawing SL 9, Pedestrian Signal Assembly	For approval	Larry Montoya Richard Hibbard
8. Retrofit Plate for Wire Loop Barrier	For information	Stan Burns
9. Review of Assignment/Action Log	For review	Jim McMinimee
10. Meeting Improvements (on-going agenda item)	For discussion	Jim McMinimee
11. Other Business	For discussion	Jim McMinimee

JCM/ba  
Attachments

cc:

Cory Pope Director, Region One	Stan Burns Engineering Services	Richard Miller Standards
Randy Park Director, Region Two	Boyd Wheeler Bridge Design	Barry Axelrod Standards
David Nazare Director, Region Three	Karl Verhaeren Construction	Patti Charles Standards
Dal Hawks Director, Region Four	Tim Biel Materials	Shana Lindsey Research
	Richard Clarke Maintenance	Tracy Conti Operations
	Robert Hull Traffic and Safety	Anthony Sarhan FHWA
	Erik Brondum Traffic Operations Control	Mont Wilson AGC
	Rex Harris Region 1, Preconstruction	Tyler Yorgason ACEC

## Agenda Listing

### Item 2:

13551	General ATMS Requirements
13552M	Ramp Meter Signals And Signing
13553	ATMS Conduit
13554	Polymer Concrete Junction Box
13555M	ATMS Cabinet
13561	ATMS Power Service
13591M	Traffic Monitoring Detector Loop
13592	Roadway Weather Information System - Environmental Sensor Station (RWIS-ESS)
13594	Fiber Optic Communication
13595	ATMS Integration
AT 2	Ramp Meter Details
AT 3	Ramp Meter Sign Panel
AT 4	Typical Ramp Meter Signal Head Mounting
AT 5	Ramp Meter Loop Installation (Title changed)
AT 6	Conduit Details
AT 7	Polymer-Concrete Junction Box Details
AT 8	ATMS Cabinet (Title changed)
AT 9	ATMS Cabinet Disconnect and Transformer Frame (Title changed)
AT 15	RWIS Site And Foundation Details
AT 16	RPU Tower Base And Service Pad Layout
AT 17	Ground Rod Installation And Tower Grounding
AT 18	TMS Detection Zone Layout

November 30, 2006

A regular meeting of the Standards Committee convened at 8:00 am, Thursday, November 30, 2006, in the 1st floor conference room of the Rampton Complex.

Members Present:

Jim McMinimee	Project Development	Chairman
Robert Miles	Standards and Specifications	Secretary
Barry Axelrod	Standards and Specifications	Recorder
Randy Park	Region 2	Member
Stan Burns	Engineering Services	Member
Karl Verhaeren	Construction	Member
Richard Clarke	Maintenance	Member
Robert Hull	Traffic and Safety	Member
Tim Biel	Materials	Member
Boyd Wheeler	Bridge Design	Member
Mont Wilson	AGC	Advisory Member
Tyler Yorgason	ACEC	Advisory Member

Members Absent:

Troy Peterson	TOC	Member
Rex Harris	Region 1, Preconstruction	Member
Anthony Sarhan	FHWA	Advisory Member
Carlos Machado	FHWA	Advisory Member

Staff:

Barry Axelrod	Standards and Specifications
Patti Charles	Standards and Specifications
Shana Lindsey	Research
Steve Anderson	Preconstruction
Darrell Giannonatti	Construction
Glenn Schulte	Traffic and Safety
Mike Donovan	Traffic and Safety

Visitors:

Justin O'Connor	3M Company, TSS Division
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## Standards Committee Meeting

Minutes of the November 30, 2006 meeting:

1. Minutes of August 31, 2006 meeting were approved as written.

**Motion:** Robert Hull made a motion to accept the minutes as written. Seconded by Randy Park. Passed unanimously.

2. Supplemental Specification 02844, Concrete Barrier and Standard Drawing BA 3C, Precast Constant Slope Barrier (Agenda Item 2) - Presented by Steve Anderson.

Steve suggested covering all the barrier items together on the agenda. This included items 6 and 7.

Steve said this was presented last time with questions that needed to be addressed before approval. He said the length was one issue and that Richard Clarke has since checked with Maintenance on the desired length. The decision was that the 15 foot length met their needs with their equipment still being able to lift the new barrier. Steve said the drawing was modified to reflect this length and the drawing again sent out for comment. Corrections were made based on comments received to the drawing as well as Section 02844, Concrete Barrier. Steve said discussions with Glenn resulted in changes to other BA drawings to help define requirements.

Discussion points were:

- Jim asked how this new length would work operationally with the current lengths already in use. Glenn said this new system does not attach to any of the current systems. Glenn added that the connection point of the new system is completely different from current systems. Glenn said a new system that had similar connection points would have to be tested so they decided to go with the one already tested.
- Randy asked if Eagle was the only supplier contacted. Steve said they also contacted another supplier but they did not have any comments. Glenn said he also contacted a supplier in Idaho who wants to break into this market and that they did not have a problem with the new system.
- Referring to the connection, someone asked if Maintenance can go in and fix the barrier after a wreck. Glenn said he did not expect the barrier to move that much. Steve cited examples of movement from the testing of the connection. He did not think the barrier would move that much either.
- Jim asked how they wanted to do the approval and whether the other items should be included in the same motion. Barry reminded them of the Supplemental Specification that also needs to be approved.

Steve went on to discuss the Supplemental. He said they took the current Specification and added in the information for the constant slope to meet the requirements of the new drawing. Referring to cost, Steve said the precast is similar in cost to the cast-in-place barrier.

- There was no discussion on the Supplemental. Discussion continued with agenda item 6 for the BA 3 drawings.

Standard Drawings, BA 3 Series Drawings (BA 3A1, Cast In Place Constant Slope Barrier; BA 3A2, Cast In Place Constant Slope Barrier, and BA 3B, Precast Constant Slope Transition Section For Crash Cushion and W-Beam Guardrail) (Agenda Item 6) – Presented by Glenn Schulte.

Glenn said two drawings were developed from the current BA 3A drawing. He said the BA 3A drawing had too much information on one page and that they received comments about that. He said they then updated the new drawings to include the new “X” connection for the new Precast Constant Slope Barrier. He said they also added details for sub-base requirements to support the systems. He said he reviewed it with Boyd. This addition was based on field problems.

Discussion points were:

- Randy asked about a solid line in Option 1 of the sub-base requirement. Glenn said he forgot to remove it.
- Tyler asked about the bevel and radius callout in the Typical Section and the Section Through Sawed Joint details. He asked if the callout was needed on both details. Glenn said it was not and he would remove the second one.
- Randy asked about the minimum requirement of the base course in Option 2. He said Option 1 shows 12 inches while Option 2 shows 4 inches. Glenn said he will update Option 2 to 12 inches.
- Referring to previous discussions on the rusting of wire loop connections Stan asked about the connection on the new barrier. He asked if they were rebar. Glenn said they are coated steel. Stan asked about the life of the pin and if we will have to come back in 20 years to replace the pins. Glenn said he expected it to be like any bridge pin. Boyd said the coating should extend the life of the pin to around 45 to 50 years, but not indefinite.

- Tyler asked about the “Except as noted” reference in note 7, BA 3A1. He said he did not see anywhere on the drawing that referred to the “as noted.” Glenn said he will remove the reference, commenting that it was from an older version of the drawing. Referring to note 4E Tyler commented about the “1.2 times” reference and that it was worded differently on other drawings and he wondered if it meant the same thing. Glenn said it did. Jim asked if he (Tyler) was bringing this up as a consistency issue and if the wording should be the same on all drawings. Tyler said yes. This refers to note 4C on this drawing and the BA 4 drawings. Glenn said he would update the references.
- Mont asked about the sealant in reference to last meeting’s discussion on BA 3C. Rich Clarke said sealant is not going to be used.
- Glenn commented on note 10, BA 3B with reference to the “X” connection, indicated this note was added. Glenn said the transition section would have to be fabricated for the connection and therefore the reason for the note.
- Referring to BA 3A2, Tyler asked if in Section C-C the reference to “V6 bars” should be “V bars.” Glenn said that has already been changed based on comments he received during coordination. Tyler said Section B-B is alright with “V6” but A-A and C-C need to be just “V bars.”
- There was no further discussion. Jim asked if they should now move on to the BA 4 drawings. Glenn said the drawings just covered can be voted on now.

**Motion:** Boyd Wheeler made a motion that Supplemental Specification 02844 and the Standard Drawings (BA 3C, BA 3A1, BA 3A2, and BA 3B) discussed in agenda items 2 and 6 be approved as discussed and modified. Seconded by Richard Clarke. Passed unanimously.

Agenda items 7 and 8 were covered next.

3. Standard Drawings, BA 4 Series Drawings (BA-4B, W-Beam Guardrail Transition; BA-4D, W-Beam Guardrail Anchor Type I; BA-4E, W-Beam Guardrail Installations; BA 4L, W-Beam Guardrail Curve Details; BA-4P, W-Beam Guardrail With Precast Barrier for Span > 25 ft; BA-4Q1, W-Beam Guardrail With Modified Curb And/Or Curb and Gutter; BA-4Q2, W-Beam Guardrail With Curb and Gutter  $\geq 5$  inches) (Agenda Item 7) – Presented by Glenn Schulte.

Referring to BA 4B, Glenn said the block requirements on the Post Placement Detail were updated. He said only two blocks instead of three are needed for posts 1, 2, 3, and 4.

Discussion points were:

- There was no significant discussion on BA 4B.

BA 4D. Glenn said delineation requirements were added based on comments from the Maintenance Sheds. Glenn said this will assist during snow plowing. He said this is already being done in Logan Canyon. Payment will be part of the system.

Discussion points were:

- There was no discussion on BA 4D.

BA 4E. Glenn said the change was the addition of the note to the Installation w/modified Type B1 Curb & Gutter. He said a new drawing was developed as a result and will be covered later. He said that placement was clarified for the Asphalt detail. Glenn said a third change was on the Barrier Installation on 6:1 Slopes. He said he received several calls over the last six months from Construction people on design and placement of the posts. He said a second post was added to the detail to assist with determining placement.

Discussion points were:

- Tyler said if he understood the detail correctly then between two and 12 feet we should not be placing barrier. Glenn said no. Glenn said barrier can be placed at the first post, two feet maximum. He said if you are going to be more than two feet over then you have to go to 12 feet. Tyler then asked if the 2 feet minimum callout should just be 2 feet. Glenn said AASHTO has a two foot minimum. Tyler said the Roadside Design Guide showed 2 feet and 12 feet. Glenn agreed, adding that he will remove the minimum callout from the drawing.
- Boyd commented about the height of the poles. Glenn said he would update the drawing to show the height reference.
- Barry commented that some of the notes that were added were not numbered. Barry asked Glenn to check the notes and update for consistency.
- There was no further discussion on BA 4E.

BA 4L. Glenn said the anchor locations and requirements were updated because of confusion by installers, suppliers, and inspectors. He said he took out the extra spacing because it is not needed.

Discussion points were:

- There was no discussion on BA 4D.



BA 4P. Glenn said Note 1 was added as a result of field visits where they observed that transition sections were not put on the trailing ends as required.

Discussion points were:

- There was a question on the note with respect to the “1.2” The note should state “1.2 times the clear...”
- There was no further significant discussion.

BA 4Q1 and BA 4Q2. Glenn said these are new drawings developed to assist designers and installers based on FHWA recommendations. Glenn referred to an incorrect installation on a project.

Discussion points were:

- Jim asked if not having the object marker was because it is behind the curb and gutter. Jim said some of the level of detail is not the same on these drawings as on others. Glenn said the object markers are shown on the actual crash cushion drawings and not here.
- Barry commented about the use of the letter “Q” and that it is hard to read as the proper letter. He said they already show the “Q” as not used on the index, suggesting using “S” instead as the next available letter. Any drawings that refer to the new drawings would have to be updated with the “S.” Glenn concurred on changing the numbering of the drawings.

**Motion:** Richard Clarke made a motion to approve Standard Drawings BA 3A1, BA 3A2, BA 3B, BA-4B, BA-4D, BA-4E, BA 4L, BA-4P, BA-4S1, and BA-4S2 as discussed and modified. Seconded by Robert Hull. Passed unanimously.

4. Standard Drawings, CC Series Drawings (CC 8A, Grading and Installation Details Crash Cushion Type G; CC 8B, Grading and Installation Details for “3R” Projects Crash Cushion Type G; CC 9A, Grading and Installation Details Crash Cushion Type H) (Agenda Item 8) – Presented by Glenn Schulte.

Glenn said the change on these drawings is to match what Maintenance has requested. He said the current systems are all using wood posts and that the change is to use steel and wood posts. Glenn said post 1 carries the head of the system and over time this post splits and allows the head to fall down, being lower than intended for an impacting vehicle. Using a steel post will keep the head in proper orientation. The wood posts over time swell in the foundation tubes and are difficult to repair. Posts 3 and 4 will use a shortened steel breakaway post inside a foundation tube.

Glenn also referred to the new Crash Cushion Guidelines that were just published.

He said the problem is occurring in other states as well. Glenn said there were no comments other than from the vendors who indicated they were happy with the direction being taken by UDOT.

Glenn then went on to introduce a Supplemental Specification for Section 02843, Crash Cushions. He said the Crash Cushion specification was updated to show product changes. This part of the discussion was not on the agenda and should have been covered under Other Business.

Discussion points were:

- Barry said there is no submittal sheet for this part of the change. Glenn said the contractors and suppliers that were contacted were fine with the change. He said FHWA has also reviewed the change.
- Glenn asked if the changes could be considered as editorial.
- Randy said it looks like we are going away from the minimum NCHRP 350 requirements and going to a UDOT Standard that is contrary. Randy asked why when we are trying to go to a national standard in other areas.
- Glenn went on to make a comment about article 2.1a being redundant.
- Randy then said he was confused and therefore more discussion is needed. Jim said that is further reason why we to through the submittal process.
- Shana asked Glenn why he came up with the UDOT guidelines. Glenn said it was a way to let people know what is out there. He said it is based on the new format that was determined three years ago with the New Products Panel. Glenn went on to say that the study that was suppose to be done out of the Panel was never done so Glenn said they adopted this based on discussions with Research, Robert Hull, and John Leonard that they would just accept NCHRP 350 as our testing criteria. Glenn said every system except for one (never presented in Utah) that has passed NCHRP 350 is listing in the Guidelines.
- There was no further discussion. Glenn asked that the CC drawings be passed as presented.

**Motion:** Randy Park made a motion to approve Standard Drawings CC 8A, CC 8B, and CC 9A as presented. Seconded by Robert Hull. Passed unanimously.

**Action Item:** Glenn Schulte to bring back Supplemental Specification 02843, Crash Cushion with submittal sheet next time.

5. Supplemental Specifications on General Provisions (00555, Prosecution and Progress; 00570, Definitions; 00725, Scope of Work; 00727, Control of Work; 01282, Payment) (Agenda Item 3) - Presented by Karl Verhaeren.

The meeting moved back to item 3 in the agenda.

Karl said they reviewed all the General Provisions and these five sections are being presented for update. He said there are minor changes from what was sent out in the coordination package. Karl asked how the Committee wanted to cover these items.

Discussion points were:

- Jim said it looked like an incredible amount of work and that Karl could cover them as he thought best. Jim said it looked like some were complex changes.

Karl started off with Section 00570, Definitions. He said several definitions were added. Karl went on to explain how the changes came about. Many parts were hard to make out on the recording because of a lot of paper shuffling around the table, creating a lot of background noise. Other parts of the recording were just hard to make out.

- Some discussion revolved around major and minor items. Karl went on to explain the previous meaning of both. The current change removes the minor item from the listing. Karl said the only change that the AGC was concerned about was in the definition of Major Contract Item with the change from 5 to 10 percent.
- Mont asked, what is a minor item? Karl said anything not a major item. Mont commented that you are just deleting the minor item definition from the listing. Karl said yes, adding that with the changes to Section 00725 minor items don't exist. Mont said some smaller subcontractors have issues with minor items with the deletion of the definition precluding their pursuance of a claim on that item.
- Jim commented that if you are worried about the consistency issue then how will one Resident Engineer (RE) deal with it versus another RE? How does a small subcontractor know that? Mont asked how a subcontractor would submit a claim on a minor item if there is no definition of one. Jim said the contract between the contractor and subcontractor could cover the issue and that it is outside of our contract.
- Karl cited information obtained from past projects. He said looking at projects that closed between May 2001 and June 2006, there were 601 projects considering 12,700 items, half which were minor items with (70) one half of one percent being adjusted. Karl said this is a very small number, adding that other provisions in the contract can handle this. Mont said if there are then this is not a problem.

- Based on a comment Karl said our contract does not deal with subcontractors. He said a contractor can always submit a claim on behalf of the subcontractor. Mont said it doesn't matter what the threshold is for a major item, 5 or 10 percent, with the point being that the AGC is trying to protect the small subcontractor that may want to pursue a claim usually always on an under run when they don't recover what they think is their true cost. He said they can't do that if there is no item defined as a minor item. Karl said they still can, explaining that it is related to contract quantities. Mont said fine if they can do that. Karl said for example if the item calls for 10 and they place anything more than five then there is no claim for adjustment under the contract.

Karl then moved on to Section 00555. Karl discussed some changes from the AGC since coordination with some parts of the submittal being removed. He said he was fine with those changes. Karl said the rest of the submitted changes are in the draft copy.

Being no comments or discussion on 00555 Karl moved on to 00725. He said there were no suggested changes to the coordinated draft.

Karl then moved to 00727. He said a part was added to article 1.19C1 and subparagraph e was added dealing with contract completion. Karl said a question was raised on article 1.7C on the superintendent being at the project site at all times.

- Mont asked what "at all times" means. Karl said that whenever work is taking place they want someone there to provide direction. This is important when a subcontractor is doing the work. Karl said there was no problem if the contractor designated someone from another agency to fill that role as long as the person can execute instructions.
- Karl said other changes the AGC was concerned about are under article 1.22E. He said their issues were with subparagraphs 17 - 22. He said these are added items from the current version. Karl said he was fine with taking out number 17 and 18, adding that he wants to work with the AGC so they have a comfort level. He said the key pieces are 19 and 20. Karl said 21 could go as well. Karl also suggested a wording change on the depreciation part.
- Jim commented on paragraph G in the submittal sheet first reading the item. "Clarification of requirements and procedures for dealing with claims and contract changes in a timely manner should reduce the number of claims escalated beyond the Resident Engineer's authority level and minimize and/or mitigate claims issues, resulting in significant dollar savings." He said it is interesting as he has watched the Department's progress with partnering and the escalation ladder. The idea that we deal with things within a certain timeframe seems to have been a good thing for our contractors. Jim asked if we applied those principles in the change to Section 00727 with respect to claims, adding that he didn't see any. He said he wondered how those things fit together.

- Karl said one of the statements he thought he made on the submittal sheet is that UDOT has a poor track record in this area. He said some recent claims have come at us out of the blue. In those situations we have not followed the partnering escalations and concepts.
- Karl said the timeliness of notification and related provisions in contracts come from the CFR. He said the CFR requires certain things. Karl said the key is to managing changes to contracts, adding that part of the poor track record comes from the time requirements for notification. Karl said the contract stipulates time requirements for both parties, the owner and the contractor. He said the way he looks at it is that partnering is sort of a separate issue. He said initially there was a perception by some contractors that partnering was a tool to defeat specifications or modify the contract in some manner. Karl said that is not the case with partnering supplementing the contract. Karl said current wording is unclear and may be the reason for not adhering to the requirements. Karl said his main goal in rewriting the specifications was to clarify requirements for both parties.
- Karl said he views the escalation as external to the contract requirements, adding that you still have to meet the contract requirements. He said dispute resolution is used when we can't come to terms in accordance with the contract requirements. He said the contract is what binds the contractor to the Department. That being said Karl said for disputes and disagreements we need to absolutely follow the escalation process. He said he thinks that whole process now works and that he does not see anything in these changes that is contrary.
- Jim said the heart of his question is at the end of a partnering process. When does the clock start ticking? Karl said he would step back a little, but was not sure this would answer the question. He went back to 00555 and 00725. He said 00555 deals mostly with time issues referring to article 1.12 in that section. He said it would take a lot of time to look through the section for all the time issues. Jim said in paragraph B the seven calendar days is what he is looking for. Karl said that is just part of it referring to other parts of the section explaining them. He said that 00725 also has similar time frames.

Karl moved on to section 01282. Karl pointed out the addition of a new article 1.4, Eliminated Items as a standard requirement. Karl read the two paragraphs, adding that the second could be worded a little better. He will update. Karl said article 1.7 was added as a proactive move to deal with related costs. He said the associated formula was modified to meet requirements.

Karl said there were a couple of changes on compensation for labor. He said that AGC requested a change to article 1.8 paragraph A2 changing the \$500 for small tools to \$200.

Karl said another issue was in article 1.10 paragraph H. He said the real issue is in the last sentence of the paragraph. He said it didn't include the cost to actually fill the stockpile. He said the best way to take care of this was to eliminate the statement completely, recommending that H be removed completely.

Karl said that time needs to be taken to discuss fuel and asphalt adjustment. He referred to article 1.12 and that most of the language is for clarification. He said the real change was that the intent was this was to be invoked automatically rather than by the contractor. He said the AGC had a concern over that. As a result Karl said he removed some of the language from 1.12C1 and added a new line allowing the contractor to invoke the provision at any time. He said it is basically the language currently in effect.

- In response to a comment Karl said the contractor could wait until the end of the contract before invoking, requiring the Department to adjust back to the beginning.

Karl said some adjustments were made to the table. He said he had some discussion with the AGC but that they did not have any concerns. He said the biggest change was in the last row of the table, pointing out several items that had been adjusted to include fuel cost on fence and marking paint. He referred to Federal requirements and that our adjustments created a bookkeeping nightmare. As a result several items were removed from the table.

Karl then moved on to the asphalt adjustment provisions. He said there has been a lot of discussion with the industry about using the adjustment provisions as updated with the Legacy project. Karl said the AGC did not apparently believe him when he said this specification would probably never end up in any contracts because it was the Department's intention to use a Special Provision for asphalt adjustments. He said the AGC wanted to make sure there was nothing that would automatically invoke the provisions.

Karl then went back to article 1.5. He said the requirements are driven by the CFR.

- Barry asked Karl about their discussion with Denise Graham on section 01284, Prompt Payment. Karl said there was some confusion about the reference in 01282 that referred to 01284, Prompt Payment. Section 01284 is required on Federal contracts. He said at one time it was a Department Special Provision but is now a Supplemental Specification. The problem was that 01282 referred to 01284 that stated this applies only on Federal Aid projects. Section 01284 also referred back to 01282. Karl said his recommendation is to modify Section 01282 article 1.9 paragraph E to make reference to Federal Aid projects. He said that should close the loop.
- Barry explained the problem with respect to the old Supplemental Specification and how this would fix it.

- Tim commented on the fuel adjustment discussion from earlier with Karl briefly restating the earlier discussion.
- Mont asked about the language that will be used to invoke the asphalt adjustment procedure. Mont asked if they would be allowed to do that. Karl said the contractor would be allowed to do so at any time, but it would be only for future adjustment, not prior.
- Darrell commented that because of the complexities Karl spent a lot of extra time on these changes. Jim thanked Karl as well.
- There was no further discussion.

**Motion:** Randy Park made a motion to approve Supplemental Specifications 00555, 00570, 00725, 00727, and 01282 as discussed and modified. Seconded by Boyd Wheeler. Passed unanimously.

6. Supplemental Specification 02056, Embankment, Borrow, and Backfill (Eliminates Sections 02056 (Common Fill), 02061 (Select Aggregate), 02324 (Compaction), 02330 (Embankment)), (Agenda Item 4) - Presented by Karl Verhaeren.

Karl said the change to Section 02056 was to simplify requirements with several areas, placing similar and related information in one place. He said the original submittal included the replacement of Section 02332, Embankment for Bridge but that has since been pulled. That one will remain a separate section and not be included in the new 02056. Karl said the change to 02056 incorporates Sections 02061, 02324, and 02330 with those sections being deleted.

Karl said in discussions with Mont, the AGC did not have any issues with this change.

Discussion points were:

- Jim asked about the Minimum Sampling and Testing requirements that are shown on the submittal, asking where or how do we get guidelines for those requirements. Karl said that could be a long discussion.
- Tim said it is what we choose as long as certain Federal quality requirements are met. Jim asked about the process to arrive at these minimums. Tim said many have been in the Minimum Sampling and Testing Guide for many years. Tim said they go through the document once in a while to update it. Karl said there are not any huge changes.
- Jim asked if any other states or entities do this type of testing or quality assurance testing. Jim said the reason for asking was that we hear all the time from auditors that our processes are expensive. Karl reviewed some of the process.

- Jim said he had a secondary question. He said it may be a misunderstanding on how it works. Jim said he understood that we had not been allowed to use a contractors QC path as part of the data set that we use for accepting material. Jim asked if there is something that we can or have done in this specification that will allow for that. Jim said if he understands correctly FHWA will allow us to do what we have documented in our process.
- Tim said that if we use contractor testing it has to be verified through independent statistical methods. He said the problem is that the only way that you can do that statistically is if you have an extremely large project. Tim said with a lot of our projects you can not get a large enough sample to be statistically independent. Tim said they have been working on this for two years with FHWA assistance.
- Jim said 15 percent of our money is now Federal and that we want to do whatever makes sense from an engineering standpoint. He said we want to do whatever it takes to make sure we are receiving quality materials. He asked, what can we do to take advantage of those tests out there? Does the specification allow for that on State funded projects or is there a differentiation? Tim said he did not think this one did. Jim said a lot of this may Special Provision questions because the program is new so he would back off.
- Tim said if we want to become more aggressive because of the 15 percent Federal funds then we can do that. Jim said it may be a way for us to prove to the Feds that the process we have in place is valid.
- Getting back to the specifications Karl said that the AGC had asked for a “track change” copy. He said that was hard to do because of the combination of several sections. Karl said he did include a document, adding that essentially the change just combines information and that there is not anything conceptually or materially changed from the information in the four sections.
- Barry commented about the related sections in specifications that refer to the ones being deleted and the name change of 02056. He said that still needs to be worked out. Karl said he sent Barry a file that lists 25 sections that are impacted. Barry said they usually do a short Supplemental Specification to handle that type of change but this would require 25 Supplemental Specifications. Barry said they do not really want to do that many and add more Supplementals to the contracts. Tim asked about putting in three for the removed ones. Barry said they do have to do those to take care of the deletions, but you still have the other 25 or so ones that are impacted by reference to the four sections being discussed with one having a new title and the three deletions. Barry said they will work it out with a memo or something similar as not to add more Supplemental Specifications.



- Barry asked if these changes are for the 2008 version or to take effect now. Karl said they take effect now. Based on comments Barry said while these are considered editorial they would still have to do a Supplemental, but would not have to bring them here for approval. Barry said even with that he did not want to put out 25 more Supplementals. That would just add more changes that would have to be put in projects. Karl asked if it would be easier to hold until the 2008 version. Barry said if it improves the process then it should go in now and they would work out the reference issue.
- Patti suggested holding the reference change to 2008 because once the user got to the related section they would see it was deleted by the Supplemental Specifications we do publish. Barry said that would work. Barry said if they get comments because of confusion then they will further address the issue. There was consensus on this recommendation.

**Motion:** Boyd Wheeler made a motion to approve Supplemental Specification 02056 as presented and eliminate Sections 02061, 02324, and 02330. Seconded by Robert Hull. Passed unanimously.

7. Supplemental Specification 02892, Traffic Signal and Standard Drawing SL 9, Pedestrian Signal Assembly (Agenda Item 5) – Removed from discussion. Not ready.

The item was pulled prior to the meeting and will be added to the next agenda.

8. Review of Assignment/Action Log (Agenda Item 9)

Jim asked Barry to review the log.

- Item 1, Rumble Strips. Barry said this initially started out as a new Standard Drawing, PV 8, for centerline and then turned into a policy for rumble strips. The policy was approved at another level but never came to the Standards Committee for review and approval. Barry asked Bob to address this so the item could be closed. Bob said they would review the policy for any changes and make sure it is consistent with the Standard Drawings. Bob said he would bring it to the next meeting. New Target Date: February 2007.
- Item 2, Three-Legged/ Four-Legged Intersection. Barry said this initially belonged to Traffic and Safety and then transferred to Standards so a drawing could be put together. Bob said they have something developed and it is out for comment. He said it should be ready for the next meeting. New Target Date: February 2007.

- Item 3, Supplemental Specification 00555M. Barry said this one is on hold because of several issues. In response to a question from Jim, Barry said the Supplemental Specification 00555 approved earlier today did not cover this item. Bob provided some background. Karl said the title of this item may be misleading because it is not really associated with 00555. This is more related to traffic control. Future reference will be to Section 01554. Bob said they would work something into this new area. Barry asked if it is still long range. Bob said it should not be. Shana said there were inconsistencies between Maintenance and what was being required from contractors. Karl said our specifications do not clearly address the issue and that it may be something that can be added into the traffic control plan. Bob said they would bring something back for the next meeting. New Target Date: February 2007.
- Item 4, Review of Standard Sheets 1B and 1C, Index. Barry said with everything going on in their area they still need to put this together into a final version so a hard copy can be printed. Barry said between now and the next meeting in February he hoped there would be time to put this together. New Target Date: February 2007.
- Item 5, Check Supplemental Specification 02896M. Barry said this item has been closed for a while but he left it on the log because of a question on marking that Mont brought up. Barry said he looked through all the minutes and specifications and also talked to Jim Baird. Barry indicated that Jim Baird said what we had was good. Barry said the minutes were updated and a note placed in the action log. Barry said there is no further follow up required. The item will be removed from the log.
- Item 6, Supplemental Specification 02844. Barry said this was approved today. Item closed.
- Item 7, Supplemental Specification 02765. Barry said this belong to Tim and was due for today's meeting, but no update was provided so it was removed from the agenda. Barry said they are working on it, adding that Degen Lewis came by yesterday (November 29) to discuss it. Degen is still working on the change. Comment indicated it should be ready for February. New Target Date: February 2007.
- Barry said the only new action log item is for Glenn's change to Section 02843, Crash Cushions. There was no other discussion on the action log.

- The status report as handed out at the meeting follows:

### **Action Item Update for November 30, 2006 Standards Committee Meeting**

(As of November 9, 2006)

**Item 1, Rumble Strips:** Item is past due. Policy already published. No coordination by the Standards Committee. No other information received. Should this item be closed.

**Item 2, New Drawing of Three-legged and Four-Legged Intersection:** Item was past due from Traffic and Safety. No information received in response to request from Traffic and Safety. The Standards Section was to put a drawing together for the October 2006 meeting. Not complete. Waiting for more information from Traffic and Safety. Should this item be closed.

**Item 3, Supplemental Specification 00555M, Prosecution and Progress, Limits of Operation:** Due date changed to open. No target date. No new information received. Should this item be closed.

**Item 4, Review of Standard Sheets 1B and 1C, Index.** Decision was that the sheets are no longer needed. A listing of all Standard Drawings with approval date to be included in all Project Table of Contents files. A hard copy book will be published for with all Standard Drawings and an effective date set. From that point all drawing changes will be treated the same as Supplemental Specification updates. Still in progress. Suggest new target date of February 2007.

**Item 5, Check Supplemental Specification 02896M:** Based on comments at the last meeting by Mont. Checked the files and with James Baird. No open issues. Closed.

**Item 6, Supplemental Specification 02844, Concrete Barrier and Standard Drawing BA 3C, Precast Constant Slope Barrier:** On agenda for approval.

**Item 7, Supplemental Specification 02765, Pavement Marking Paint:** Due for the current meeting but no files received. Request for information indicated Tim was checking but not further information was received. Removed from agenda.

#### 9. Meeting Improvements (on-going agenda item) (Agenda Item 10).

Jim introduced Robert Miles as taking Richard Miller's place in Preconstruction. Jim also introduced Justin O'Connor from 3M as a guest at the meeting. Jim said Justin was here to learn about the Standards Committee process.

#### 10. Other Business: Jim said he had one other item that has never been done before. He said he has been keeping an eye out to see if someone would emerge to take Claire Hendrickson's place, a former FHWA representative who could be counted on to see the details that no one else would. Jim said today a replacement emerged who did a fantastic job. Jim recognized Tyler Yorgason and presented him with a briefcase to carry his UDOT stuff in.

Jim wished everyone a Merry Christmas and a Happy New Year and to have a great holiday. He said this is our last meeting of the year and that the December meeting will not be held.

In response to a question on the new specifications Barry said nothing has changed and the target is still January 2008 with all changes being approved by October 2007.

A motion was made, seconded and approved to adjourn.

The next regular meeting of the Standards Committee has been scheduled for Thursday, February 22, 2007, at 8:00 a.m., in the 1st floor conference room of the Rampton Complex.

**Approval of Minutes:** The foregoing minutes were approved at a meeting of the Standards Committee held \_\_\_\_\_, 2007.

## Assignment/Action Item Log

Date Initiated/Updated	Item #	Action	Assignments	Status	Target Date
June 27, 2002	1	Standard Drawing PV 8 (Rumble Strip)	Darrell to assign someone from Construction.	Open	February 2007 meeting
October 31, 2002			Richard Miller from Maintenance. Fred Doehring. Betty Purdie. Robert Hull to head the group.		
December 19, 2002		- Process being reviewed. Research looking into testing.	Robert Hull Stan Burns		
February 27, 2003		- A policy is to be developed over the next several months. <b>(Original PV 8 reviewed)</b>	Robert Hull Stan Burns		
April 24, 2003		- No change			
June 26, 2003		- No further updates. Target date changed.			
August 28, 2003		- Progress continuing. To work with Research.			
October 30, 2003		- Process continuing.			
December 18, 2003		- Still being worked.			
February 26, 2004		- No update			
April 29, 2004		- Jim to follow up with Research.			
June 24, 2004		-Research has study with University of Utah			
August 26, 2004		- Research study complete. Policy being written.			
October 21, 2004		- Waiting for BYU study results.			
February 24, 2005		- Still being reviewed. Target changed.			
April 28, 2005		- No change			
June 30, 2005		- No one present to discuss.			
August 25, 2005	- QIT working on a policy. Item being tracked as Rumble Strip Policy.	Traffic and Safety - Robert Hull			
October 27, 2005	- December meeting canceled. Target date updated.				

Date Initiated/Updated	Item #	Action	Assignments	Status	Target Date
February 23, 2006 April 27, 2006 June 29, 2006 August 31, 2006 November 30, 2006 February 22, 2007	1	<b>Item continued.</b> Standard Drawing PV 8 (Rumble Strip) - Policy approved. Drawing to be completed. - Policy approval discussed. Never brought to Standards for review and approval. - Committee still needs to review the policy  - No change in policy review requirement. Drawing needs to be created or current drawings updated.  - Item to be reviewed and updated to be consistent with Standard Drawings.  - Supplemental Drawing PV 8 and Policy on agenda.	Traffic and Safety - Robert Hull    Steve Anderson (drawings)   Robert Hull		February 2007 meeting
August 28, 2003 October 30, 2003 December 18, 2003 February 26, 2004 April 29, 2004 June 24, 2004 August 26, 2004 October 21, 2004 February 24, 2005 April 28, 2005	2	A new drawing depicting the three-legged/four-legged intersection to be developed. - No change in status. - Target date set. - No change. - Being developed - No report. Not due until August. E-mail sent to SAF and RES. - No change except target date. - Still under development. Target date moved. - No change. Work priorities prevented further review. - No change	John Leonard	Open	February 2007 meeting

Date Initiated/Updated	Item #	Action	Assignments	Status	Target Date
<p>June 30, 2005 August 25, 2005 October 27, 2005 February 23, 2006</p> <p>April 27, 2006 June 29, 2006</p> <p>August 31, 2006 November 30, 2006 February 22, 2007</p>	2	<p><b>Item continued.</b> A new drawing depicting the three-legged/four-legged intersection to be developed.</p> <ul style="list-style-type: none"> <li>- No one present to discuss.</li> <li>- Looking at three-legged intersection first.</li> <li>- Not due. No action required.</li> <li>- Reviewed by the Traffic Engineering Panel. Drawings being developed.</li> <li>- Still on target for June 2006.</li> <li>- No new status. Standards to develop new drawing</li> <li>- Drawing needs to be created.</li> <li>- Drawing developed and out for comment.</li> <li>- Still being worked</li> </ul>	<p>Richard Miller</p> <p>Steve Anderson Robert Hull</p>		February 2007 meeting
<p>August 25, 2005</p> <p>October 27, 2005</p> <p>February 23, 2006</p> <p>April 27, 2006</p> <p>June 29, 2006</p> <p>August 31, 2006 November 30, 2006</p> <p>February 22, 2007</p>	3	<ul style="list-style-type: none"> <li>- Supplemental Specification 00555M, Prosecution and Progress, Limits of Operation: Coordinate the required action to have the process placed in the proper location, to the detail necessary and bring the recommendation to the Standards Committee for approval.</li> <li>- Item not ready. To be reviewed by the Operations Engineer. Target date updated.</li> <li>- Direction being reviewed by upper management.</li> <li>- Still being review by upper management for direction.</li> <li>- No change other than item may be on hold.</li> <li>- No change.</li> <li>- Item being reviewed. Changed to track as Section 01554.</li> <li>- Still being worked</li> </ul>	<p>John Leonard</p> <p>Tracy Conti Robert Hull</p> <p>Robert Hull</p>	Open	February 2007 meeting

Date Initiated/Updated	Item #	Action	Assignments	Status	Target Date
April 27, 2006	4	Put team together to review the removal of Sheets 1B and 1C and make recommendation.	Richard Miller Barry Axelrod	Closed	February 2007 meeting
June 29, 2006		To be reviewed with Construction and recommendation made.			Closed
August 31, 2006		Removal of Sheets 1B and 1C approved in separate meeting. New hard copy drawing book to be printed and procedures updated			
November 30, 2006		Hard copy to be put together and printed.	Barry Axelrod		
February 22, 2007		Updated Committee with completed actions.			
August 31, 2006	5	Supplemental Specification 02765, Pavement Marking Paint. To be updated to meet Materials and Maintenance requirements.	Tim Biel Degen Lewis Vincent Liu	Open	February 2007 meeting
November 30, 2006		Still being worked on.			
February 22, 2007		On agenda for approval			
November 30, 2006	6	Supplemental Specification 02843, Crash Cushion update.	Glenn Schulte Mike Donovan	Open	February 2007 meeting
February 22, 2007		On agenda for approval			



<b>Closed Items From Last Meeting</b> (November 30, 2006)					
Date Initiated/Updated	Prior Item #	Action	Assignments	Status	Target Date
August 31, 2006	5	Check Supplemental Specification 02896M for wording on the mark or dimple and who places the mark or dimple. The Supplemental Specification covers the requirement so there is no need to duplicate on the Standard Drawing. The surveyor who sets the right of way marker (usually the contractor's surveyor) should set, mark and file a record of survey for the project. It could be a UDOT surveyor if UDOT does the construction staking.	Barry Axelrod with coordination with James Baird	Closed	None
November 30, 2006		Update provided to the Committee.			
August 31, 2006	6	Supplemental Specification 02844, Concrete Barrier and Standard Drawing BA 3C, Precast Constant Slope Barrier. Resolve issues brought up during meeting discussion and determine barrier length.	Steve Anderson	Closed	Closed
November 30, 2006		Approved			

# **Standards Committee Agenda Items Section**

Submittal Sheets, Supplemental Specification Drafts, Standard Drawing Drafts, and other supporting data for the February 22, 2007 Standards Committee meeting follows.

## Standards Committee Submittal Sheet

Name of preparer: Todd Mac Gillvray, Aaron Buchanan, and Erik Brondum

Title/Position of preparer: Senior Engineer, ITS Designer, and ITS Standards Engineer (Sponsor)

Specification/Drawing/Item Title: ATMS Standard Specifications and Drawings

Specification/Drawing Number: 13551 through 13555, 13561, 13591, 13592, 13594, 13595,  
AT 2 through AT 9, and AT 15 through AT 18

**Enter appropriate priority level:**

(See last page for explanation)

3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

The proposed changes are a result of a comprehensive review for purposes of updating all of the ATMS Specifications and Drawings. Some of the major changes are described below. See the attached comment logs for more comprehensive information.

13551 General ATMS Requirements- Clarified items regarding testing, documentation, coordination, and approvals that must take place throughout the project. Includes work related instructions for weed and erosion control. Expanded to include "surface" utilities in addition to "underground" and "overhead." Contractor now required to verify existing underground utility markings with potholing. Potholing will not be paid for separately when performing ITS/ATMS work. The intent of these changes is to better protect the Department and clarify what was wanted originally in performing this type of work.

Altered the website reference for testing forms to send Contractors and Resident Engineers to a more direct location. **(From Standards and Specifications - This change can not be done. All references in Specifications must be to our Standards and Specifications References Web site as show on the original files. That allows us to quickly verify links and make updates without changing Specifications. This procedure was established several years ago. Files were updated by Standards prior to inclusion in the Agenda Package. Barry Axelrod)**

13552 Ramp Meter Signals and Signing– Adds option to have 2 vehicles per green on metered ramps. The requirement to wrap signal heads if turn on is not immediate was removed. Clarifies that 240 volt power service is always required.

13553 ATMS Conduit- Removes the one inch locate conduit and instead has locate wire in each individual conduit for cost savings. Removes the terminating attachments for each junction box. Includes requirements for flowable fill. Flowable fill is an increased cost, but protects the conduit at the junction box locations. Another addition states that the Department will not grant additional time or money for installing conduit in difficult subsurface conditions. This will allow the Resident Engineers contractual language to hold Contractors to unit bid prices, rejecting attempts for “rocky” condition change orders.

13554 Polymer Concrete Junction Box- Changed the bolt type from pent head to hex head for easier access and reduced cost. Includes requirements for flowable fill. Flowable fill is an increased cost, but protects the conduit at the junction box locations.

13555 ATMS Cabinet- Clarifies the orientation of the ATMS Cabinet for better protection

13561 ATMS Power Service- Allows more options for locks for the supplemental disconnect. Increased requirements for copper conductor.

13591 Traffic Monitoring Detector Loop– Allows the performance of the Local Field Operations Test after the opening of all lanes to traffic. Clarified loop sealant installation. Requires the loop sealant to cover the lead in wires as well as the loop. Changed the minimum depth for the encapsulated loops from 1- 5/8 inches to 3 inches.

13592 RWISS-ESS– Clarified what the contractor will do and what the department will do. Identifies the fence and gate that is required. Describes the submittal and notification time requirements.

13594 Fiber Optic Communication– Requires that contractor must label fiber “UDOT fiber”. Removed receiving test.

13595 ATMS Integration– Removed the requirements for troubleshooting. Altered the website reference for testing forms to send Contractors and Resident Engineers to a more direct location.

AT 2 to AT 5 - Added option to have 2 vehicles per green on metered ramps. Replaced AT 3 with AT 3A and AT 3B to allow the required space for the new sign data. Adjusted signal head height to conform with MUTCD. Restricted use of side signal head for single lane ramps only. Added 8-inch and 12-inch visor in detail legend on AT 4. Added notes to reference SL drawings for detection and allow the placement of the cabinet on either side of traffic.

AT 6 – Included a statement about using flowable fill around all junction boxes at exposed areas. Removed 1-inch locate conduit with wire. Required the installation of locatable pull tape in all empty conduits and locator wire with fiber as a more cost effective and functionally superior alternative.

AT 7 – Removed bolt sizes. Allow compactable native soil as well as Granular Backfill. Remove load ratings, terminal blocks, and wrap wire around ground rod. Required that new conduit be aligned by color on each side of the junction box.

AT 8 – Showed direction of traffic relative to cabinet orientation.

AT 9 – Increased the conduit size into the disconnect and transformer. Switched the position of the transformer and the disconnect.

AT 15 to AT 17 – Updates notes and converted inches to feet-inches to be consistent with the specification changes and other drawings.

AT 18 – Added extra lane to traffic to account for wider freeways.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

Measurement and Payment does not change with these updates. Currently there are no M&P defined for the ITS/ATMS items. A future standards submittal anticipated for 2007 will have a comprehensive listing of proposed M&P items.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

Proposed changes to specs and drawings were sent December 22, 2006 for review and comment. No comments were received as of January 19, 2007.

ACEC Comments: (Use as much space as necessary.)

Proposed changes to specs and drawings were sent December 22, 2006 for review and comment. No comments were received as of January 19, 2007.

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)  
Troy Peterson; email and in person; see comment logs  
Mark Parry; email and in person; see comment logs  
Deryl Mayhew; email and in person; see comment logs  
Bill Butterfield; email and in person; see comment logs  
Robert Gibby; email and in person; see comment logs  
Rich Montgomery; email and in person; see comment logs  
Scott Jones; email and in person; see comment logs, Polymer Concrete Junction box only  
Clark Mackay; email; see comment logs  
Karl Verhaeren; email; no comments

The following remaining UDOT staff were contacted January 2, 2007 by email for review comments and none were received: Betty Purdie; Daniel Young; Dennis Simper; David Holmgren; Darren Rosenstein; Fred Jenkins; Greg Searle; Hugh Kirkham; Jack Lyman; James Cox; John Butterfield; Jim Golden; Jim McConnell; Josh VanJura; Kelly Barrett; Kevin Griffin; Lyndon Friant; Larry Gay; Michelle Page; Mike Seng; Nick Peterson; Robert Dowell; Rodney Terry; Russ Tangren; Robert Westover; Rob Wight; Scott Andrus; Scott Munson; Steven Niebergall; Steve Poulsen; Beckie Case; Dyana Jacobs; Joyce Ball; Larry Myers; Peter Negus; Stan Adams; Trent Nielsen

#### Construction Engineers

Contractors (Any additional contacts beyond “C” above.)  
FiberTel; Todd Fisher; email; no concerns or comments regarding the change  
Hidden Peak; Dereke Lee; email; no concerns or comments regarding the change  
American Fork City; Brad Smith; email; no concerns or comments regarding the change

Suppliers  
None

Consultants (as required) (Any additional contacts beyond “C” above.)  
TransCore; Aaron Cloward; see comment logs  
TransCore; Bob Strong; see comment logs  
TransCore; Jeff Hermreck; see comment logs  
TransCore; John Haigwood; see comment logs  
TransCore; Jonny Turner; see comment logs  
TransCore; Shelby Hansen; see comment logs  
TransCore Inspector; Gerard Kies; see comment logs  
Iteris; Sam Sherman; ATMS cabinet comment regarding door opening—see comment log

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

Todd Emery

Carlos Machado

Proposed changes to specs and drawings were sent December 22, 2006 for review and comment. No comments were received as of January 19, 2007.

Others (as appropriate)

E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)  
Not applicable at this time.
2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)  
Not applicable at this time, but impact to the PDBS are anticipated in a future M&P submittal.

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)  
The plan is to use these specs and standards on current ITS projects until they are fully approved by committee. Contractors have been made aware of new specs/standards and the intent to have them approved at the February 22, 2007 meeting. However, priority level 3 is adequate.

Training should not be required to implement the changes made as they are self-explanatory. IMSA Level 2 training taught by Bob Strong provides an additional forum to discuss current UDOT standards and answer questions. Further, Erik Brondum the ITS Standards Engineer can field questions.

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.  
Not applicable since there are no ITS/ATMS bid items generating a history yet. However, the changes represent a savings from the way the standards currently read.
2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).  
No impact anticipated.

3. Life cycle cost.  
No impact anticipated.

- G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)  
The per foot cost for the installation of conduit should be reduced due to the removal of the 1-inch locate conduit. For example, if the material and installation cost for 1-D Conduit is currently \$15.00, the price should lower by about \$1.20 per foot. This assumes (1) that the installation of the 1" locate conduit is \$1.00 per foot, (2) the material cost for 1"locate conduit is \$0.50 per foot, (3)the material cost difference between detectable pull tape and typical pull tape is \$0.02 per foot per empty cell, and (4) the cost for #14 THWN locate wire included with fiber is about \$0.25 per foot. Adding (1) + (2) – (3)\*3 – (4)\*1 gives about \$1.20.

Most of the spec changes were to help clarify the standards, remove redundancies, incorporate repetitive special provision passages that are more general in nature, reduce change order requests, allow greater design flexibility, allow greater construction flexibility, meet the needs of traffic growth, and reduce contract duration.

- H. Safety Impacts?  
None anticipated.
- I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.  
Most of these specs and about half of the standard drawings have had additional Region 2 review in November 2006 as part of project ITS-ST99(11) that will install one VMS, one CCTV pole, and one RWIS in Wendover. **Previously approved 2005 Supplementals with the same spec number should be replaced by these.** Their information has been incorporated and modified as part of this review. **(When published the Standards and Specifications Section will replace all previously approved Supplemental Specifications with the newer version. Barry Axelrod)**

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

- Priority 1      Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised.
- Priority 2      Upon posting, this impacts projects being advertised.
- Priority 3      Upon posting, the approved standard takes effect **four weeks** later for projects being advertised.



Supplemental Specification  
2005 Standard Specification Book

SECTION 13551

**GENERAL ATMS REQUIREMENTS**

Delete Section 13551 and replace with the following:

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A. ~~Furnish Materials and procedures for~~ and installing all ATMS components as defined ~~on the plans, specifications, details, and special provisions in the contract.~~
- B. Provide all documentation required for the installation and testing of ATMS components.

**1.2      RELATED SECTIONS**

- A. Section 00725: Scope of Work
- B. Section 01554: Traffic Control
- ~~C. Section 01721: Survey~~
- C. Section 01571: Temporary Environmental Controls
- D. Section 01721: Survey
- E. Section 02911: Mulch
- F. Section 02922: Seed, Turf Seed, and Turf Sod
- ~~DG. Section 13554: Polymer Concrete Junction Box (It is in a deleted area, 3.9 C.)~~
- ~~EH.~~ Section 13591: Traffic Monitoring Detector Loop
- ~~FI.~~ Section ~~15595~~ 13595: ATMS Integration

### 1.3 REFERENCES

- A. AASHTO M 232: Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware (nuts, washers, and anchor bolts)
- B. AASHTO M 314: Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- C. AASHTO Roadside Design Guide (current edition)
- D. AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (current edition)
- ~~E. Manual on Uniform Traffic Control Devices (MUTCD; current edition)~~
- ~~EF. ASTM D 3005, Type I or II. UL 510~~
- ~~FG. American Wire Gauge (AWG)~~
- ~~H. Electronic Industries Association (EIA) and Telecommunications Industry Association (TIA) Specifications (It is in a deleted area, 2.2 I.)~~
- ~~HF. International Building Code (IBC)~~
- ~~IJ. International Municipal Signal Association **Regulations**~~
- ~~J. Manual on Uniform Traffic Control Devices (MUTCD; current edition)~~
- ~~K. National Electrical al Code (NEC)~~
- ~~L. National Electrical Safety Code (NESC)~~
- ~~M. Rural Electrical Association (REA) Bulletins~~
- ~~N. USDA Rural Utilities Service (RUS) Bulletin~~
- ~~O. Underwriters Laboratory (UL)~~

### 1.4 DEFINITIONS

- A. ATMS - Advanced Traffic Management System

- B. CCTV - Closed Circuit Television
- C. RMS - Ramp Meter System
- D. RWIS - Road Weather Information System
- ~~EF~~. TMS - Traffic Monitoring Station
- ~~FG~~. VMS - Variable Message Sign
- ~~GH~~. WIM - Weigh In Motion

## 1.5 SUBMITTALS

- A. Provide all required submittals as described in this ~~s~~Section, article 2.1, paragraph A.

## 1.6 WARRANTY

- A. Provide warranties of merchantability and fitness for a particular purpose for all furnished equipment, as a whole, each of its components, and the workmanship for the duration of one year from the date of acceptance of the entire project by the Department.
- B. Warranties are not required for ~~State-State~~Furnished equipment.
- C. Take any corrective action necessary during the Warranty Period, within 72 hours ~~after notification of being notified~~ by the Engineer, to restore any identified deficiency caused by defective workmanship or materials. Repair or replace defective items. Notify the Engineer when corrective action has been completed.

## PART 2 PRODUCTS

### 2.1 DOCUMENTATION

- A. Submittals
  - 1. Provide two copies of all documentation to the ~~engineer~~Engineer. Install one additional copy in a weatherproof sealable sleeve and place in each field cabinet.

2. The general purpose and content of all required submittals is described in Table 1. Refer to the appropriate specifications for details of the submittal requirements and test procedures for each ATMS device ~~type~~. Obtain UDOT's newest version of the test procedures for the local field operations test from the UDOT website. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>. Refer to <http://www.dot.utah.gov/index.php?m=c&tid=332><http://www.udot.utah.gov/index.php/m=c/tid=719>.

**Table 1**  
**Submittal Requirements**

Name	Timeline	Description
Contractor Furnished Material and Equipment Lists	Submit within <u>15 fifteen</u> business days from Notice to Proceed.	Include the name of manufacturer, size, and identification number. <u>Obtain approval from the Engineer before ordering any contractor furnished equipment. All contractor furnished equipment must be approved by the Engineer prior to ordering.</u>
Test Reports (for Cable and Conductor <del>test</del> <u>Test</u> , the Local Field Operations Test, and Acceptance Tests.)	Submit within five business days from the completion of a successful test.	<del>To be provided</del> <u>Provide</u> after the completion of a successful test. Test Reports are required for each appropriate ATMS device installation, including, but not limited to CCTV, VMS, RWIS, WIM, Traffic Monitoring Detector Loops or other specified detection device, and Fiber Optic Communication Systems. Provide Test Reports in a neatly bound ( <del>3'</del> <u>3</u> -hole) and printed format. The Test Reports will include the following: <ol style="list-style-type: none"> <li>1) All test results (including failed tests)</li> <li>2) Description of any observed discrepancies</li> <li>3) Description of required corrective action</li> <li>4) Estimated time to complete corrective action and re-test</li> <li>5) Results of any corrective action</li> </ol>

Name	Timeline	Description
Completion Notice	Provide to the Engineer after all devices have successfully passed the Local Field Operations Tests, at least five business days before beginning acceptance tests.	Consists of the certification that all ATMS installations are compliant with all project requirements. Use the Local Field Operations Testing Completion Notification Form obtained from the UDOT website. <u>Refer to <a href="http://www.udot.utah.gov/index.php/m=c/tid=719">http://www.udot.utah.gov/index.php/m=c/tid=719</a>. Refer to <a href="http://www.dot.utah.gov/index.php?m=c&amp;tid=332">http://www.dot.utah.gov/index.php?m=c&amp;tid=332</a><a href="http://www.udot.utah.gov/index.php/m=c/tid=719">http://www.udot.utah.gov/index.php/m=c/tid=719</a>.</u>
Compliance Certificate	Submit within five business days of receipt from the Manufacturer for each site.	Provide an installation compliance certification from the manufacturer on required equipment.
Manufacturer's Equipment Documentation	Must be received and accepted before Final Acceptance	Submit all factory issued manuals (per this section, article 2.1, paragraph B), software, detailed shop drawings, wiring diagrams, certifications, warranties, instruction sheets, and part lists for all contractor furnished items to the engineer.
As-Built Drawings	Must be received and accepted before Final Acceptance	Refer to section 01721

B. Factory Issued Manuals

1. Acceptable factory manuals must contain technical, diagnostic, and maintenance (preventative and troubleshooting) information. Advertising brochures and catalog cuts not accepted.

## 2.2 WIRING

A. Copper, as specified. ~~International Municipal Signal Association (IMSA)~~National Electrical Code (NEC).

B. Size as specified. American Wire Gauge (AWG).

C. Power Conductors:

1. Power source conductors, copper, type RHH, USE, RHW.

~~C. Service Cable:~~

- ~~1. Single conductor, as specified. Type THWN, THW, THHW.~~

D. Signal Cable:

1. Multi-colored cables, as specified.
2. IMSA 20-1

E. Ground Wire:

1. Solid, bare, soft-drawn, copper wire, as specified.
2. NEC 250.1.

F. Splice Sealing: Rural Electrical Association (REA) Bulletin 345-72.

1. Use approved direct buried, rigid body splice kits with reenterable, gel-filled encapsulant and listed in the USDA Rural Utilities Service (RUS) List of Materials, Informational Bulletin (IP) 344-2, Section 2 - Housings, Splice Cases, etc. Properly size for the cable or wire being spliced.
2. ASTM D 3005, Type I or II. UL 510.

~~G. Power Conductors:~~

- ~~1. Power conductors, copper, type RHH, USE, RHW.~~

~~H. RS-232/RS-422 Cables:~~

- ~~1. 24 AWG stranded tinned copper drain wire.~~
- ~~2. 4 twisted pairs.~~
- ~~3. Overall aluminum polyester shielded.~~
- ~~4. PVC jacket.~~
- ~~5. Nominal outside diameter of 0.28 in.~~
- ~~6. Nominal impedance of 100 (ohms).~~
- ~~7. Nominal capacitance of 12.8 pF/ft between conductors.~~
- ~~8. Nominal capacitance of 25 pF/ft between one conductor and the other conductors connected to shield.~~

~~I. Category 5 Cable (CAT 5) as specified in ANSI/TIA/EIA-568-B. Refer to NEC, Article 800.~~

GJ. Detector Cables as specified in Section 13591.

## PART 3 EXECUTION

### 3.1 TESTING AND ACCEPTANCE

- A. The following tests will be required for all appropriate ATMS devices:
1. Cable and Conductor Test
  2. Local Field Operations Test
  3. Acceptance Tests
  4. Remote Operations Test where communication is established or available.
- B. Notify the Engineer at least five working days ~~prior to~~before the proposed date and time of all tests.
1. Obtain UDOT's newest version (at time of bid) of the ~~Five-Day~~ ATMSs Testing Prenotification Form from the UDOT Web site. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>. Refer to <http://www.dot.utah.gov/index.php?m=c&tid=332><http://www.udot.utah.gov/index.php/m=c/tid=719>.
  2. The Engineer or the Engineer's Agent ~~witnesses~~ must witness the tests.
- C. Before any connections are made, perform the Cable and Conductor Test.
1. Obtain UDOT's newest version of the ATMS Cable and Conductor Test Form from the UDOT Web site. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>. Refer to <http://www.dot.utah.gov/index.php?m=c&tid=332><http://www.udot.utah.gov/index.php/m=c/tid=719>.
  2. ~~Prior to~~Before any testing, verify that all cables and conductors are installed as per the manufacturer's plans and recommendations.
  3. Perform all resistance testing after final termination and cable installation, but ~~prior to~~before the connection of any electronics or field devices.
  4. Replace the cable, then retest new cable as specified above should any cable fail to meet these parameters, or should any testing reveal defects in the cable.
  5. Furnish all equipment, appliances, and labor necessary to test the installed cable and conductors.
- D. Refer to the appropriate Standard Specification, Supplemental Specification, or Special Provision for device specific Field Operations Test procedures.
- E. Refer to Section 13595 for Acceptance testing procedures.

### 3.2 EXISTING FACILITIES

- A. Until Final Acceptance, repair any damage to ~~any~~ traffic signal equipment, lighting equipment, utilities, and other ATMS devices, ~~including but not limited to e.g.,~~ conduit, junction boxes, underground traffic signal circuits, power sources, or power conductors, ~~that are~~ caused by ~~the Contractor's contract~~ activities, third party activities, or failure to maintain adequate traffic control or protection of the work. ~~(This includes items to be salvaged, such as e.g., cabinets or poles.)~~ Request a meeting with the Department and the party with current maintenance responsibility to verify that all existing equipment is in working order at the work site. Test all loops, cabling, connectors, cabinet operations, etc. Request, coordinate, and conduct the on-site meeting and provide all labor, materials, test equipment, and test documentation. All testing will be non-destructive. If work begins at a location without arranging this testing, it will be assumed that all ~~cabinet components and operations~~ work site materials and equipment ~~were~~ in proper working order at ~~that time~~ construction initiation and responsibility ~~is~~ assumed for its proper operation upon completion of the work. If no pre-testing is ~~completed~~ performed, any equipment that is not functioning at the time the work is completed, will be assumed to have been working at the project start and must be replaced at ~~the Contractor's expense~~ no additional cost to the Department.
- ~~B.~~ B. Locate and mark all utilities ~~prior to initiation of~~ before beginning construction. Contact Blue Stakes and schedule the location of underground utilities. Contact any utilities and local government agencies not participating in Blue Stakes locate services. ~~Any utilities shown on the plans concerning T~~ the type and location of any existing underground, surface, and overhead utilities identified in the contract ~~is are~~ shown in an approximate manner only and have not been independently verified by the Engineer or the Engineer's Agent. Determine the exact location of all existing utilities by verifying markings with potholing before commencing work, and be fully responsible for any ~~damage~~ that might result from ~~the Contractor's~~ failure to locate and preserve any underground, surface, and overhead utilities. Location activities may include potholing utilities where elevation data is not provided by other location services.
- ~~B.~~ B. ~~Perform all work and install all ATMS materials (e.g., conduit, junction boxes, cabinets, poles, VMSs, detectors, RWIS, and WIM) within Department rights of way or easements. Where this is not feasible, acquire only right of way or easements that the Department agrees to pay for.~~
- C. ~~Following any repairs to underground facilities, e~~ Contact the Engineer for inspection; ~~prior to~~ before restoring cover to any underground facilities repaired during contract execution.



- D. ~~If any conflicts with existing facilities are identified,~~Identify any conflicts with existing facilities and contact the Engineer to re-locate any project foundations, trenches, or other items, ~~prior to before~~ further construction work.
- E. ~~Arrange to have a utility company inspector on site when doing any construction within ten feet of existing facilities. Notify utilities for verification of working clearances and arrange to have a utility company inspector on site if necessary.~~
- F. Place electrical service requests and orders and coordinate with as well as all other necessary utilities ~~easy coordination with all utility companies in an efficient manner as to not~~without delaying the project.
- G. Any pre-marking of ATMS equipment locations in the field by the ~~designer~~ Designer has been performed without consideration of existing underground utilities. ~~Determine~~ Identify and resolve any conflicts with existing utilities at locations pre-marked in the field by the Designer.
- H. Do not proceed on work occurring outside Department right-of-way until the required permits, environmental clearances, and approvals are obtained from all ~~local~~ entities. Determine right-of-way boundaries before starting work.
- I. Do not cut any limited access fences.
- J. Perform all digging using hand tools or suction, ~~without power equipment~~ if any construction is to take place within two feet of existing facilities.

### 3.3 LOCATION OF INSTALLED ~~EQUIPMENT~~ MATERIALS

- A. Proposed equipment locations may be modified to avoid conflict with underground utilities or other obstructions. Consult Engineer for approval.
- ~~B. —~~ Locations staked in the field, described in the specifications, and dimensioned on the plans and details are approximate. Coordinate with the Engineer to have the Engineer or the Engineer's Agent on-site to field locate all new facilities, e.g., cabinet foundations, camera poles, detector poles, and junction boxes.
- ~~B. —~~ Install all above-ground equipment the maximum practical distance from traffic or behind barrier or other approved protection.
- ~~CC.~~ Field locate equipment with the Engineer.
  - 1. Avoid areas with poor drainage, and place for minimum impact from thrown snow.
  - 2. Place for maximum accessibility and safety for maintenance personnel.
  - 3. Satisfy clear zone requirements as defined in the AASHTO Roadside Design Guide (current edition), Chapters 3 and 4.

~~DD.~~ Minimum distance behind concrete barrier or guardrail for all above ground equipment: 34 ft.

~~E. Minimum distance behind concrete barrier for all above ground equipment: 2 ft.~~

### **3.4 WEED AND EROSION CONTROL**

A. Control invasive weeds (listed on the Utah State Noxious Weed List and the county's weed list) by cleaning earth-moving equipment before bringing it on the project, and using pre-emergent, selective, and non-selective herbicides applied by state licensed pesticide applicators.

B. Treat existing noxious weeds ~~ten~~10 days before starting earthwork operations.

C. Follow all regulatory, application, and safety precautions listed by the herbicide manufacturer.

D. Use temporary erosion control devices or methods to prevent erosion and sedimentation. Refer to Section 01571.

E. Seed or sod completed areas (including trenches) within 14 days. Submit the proposed installation schedule to the Engineer and receive approval before execution. Apply wood fiber mulch on top of seeded areas unless otherwise specified. Refer to Sections 02911 and 02922.

### **3.54 EXCAVATION**

A. Do not damage streets, sidewalks, landscaping, or other surrounding ~~conditions when excavation is required.~~ features.

B. Do not excavate wider than necessary for the proper construction of the foundations and other equipment.

~~C. Do not perform excavation until immediately before construction of foundations.~~

~~DC.~~ Place the material from the excavation in a position that will minimize obstructions to pedestrian or vehicular traffic and interference with surface drainage.

~~DE.~~ Remove all surplus excavated material and properly dispose of it within 48 hours as directed by the Engineer.

~~F. Notify the Engineer after each excavation is completed that the site is ready for inspection.~~

~~EG.~~ Do not cover any underground materials or equipment fill under any circumstances, ~~without the approval of the Engineer~~until inspected and approved by the Engineer.

~~FH.~~ ~~Barriade and cover all excavations to provide safe passage for pedestrian and vehicular traffic at the end of each working period.~~

~~I.~~ ~~Keep sidewalk and pavement excavations well covered and protected to provide safe passage for pedestrian and vehicular traffic until permanent repairs are made.~~Protect pedestrian and vehicular traffic from all excavations.

### 3.65 ANCHOR BOLTS

A. Place and hold anchor bolts in proper alignment, position, and height during the placing and vibrating of concrete.

~~B. Assemble bolts, nuts, washers and torque bolts as required by the manufacturer.~~

~~BC.~~ Conform to minimum requirements of AASHTO M 314 for anchor bolts. Do not weld anchor bolts to reinforcing steel. Galvanize all nuts, washers, and anchor bolts in accordance with AASHTO M 232.

~~C.~~ Install anchor bolts in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (current edition) Article 5.17. Retighten all nuts after the structure is fully loaded.

### 3.76 TRAFFIC CONTROL

A. Refer to Section 01554.

B. Submit all lane closure and traffic control plans to the ~~Department~~Engineer for approval. Refer to Section 01554.

C. Contact each business manager 48 hours ~~prior to~~before construction ~~ffecting impacts~~ any business access. Place BUSINESS ACCESS signs (consistent with the current MUTCD) where access to the business is not readily apparent anytime an access is closed. ~~Keep at least one driveway open during periods when business is open for businesses with multiple driveways. Coordinate with the business owner for businesses with only one driveway to minimize the amount of time that the driveway is closed.~~

### **3.87 TEMPORARY TRAFFIC SIGNAL TIMING**

- A. ~~Design and implement any temporary traffic signal timing or phasing required for traffic management during construction. Submit any proposed timing or phasing changes, including any temporary signal head placement, to the Engineer for review and approval seven days in advance.~~
- B. ~~Implement the approved temporary changes including for example, programming the controller, relocating traffic signal heads and, recabling. Contact the Engineer for inspection (giving 24 hours notice) prior to implementing temporary phasing. Notify the Engineer and the Traffic Signal Coordination Engineer for approval before implementing temporary changes.~~

### **3.98 REUSE OF EXISTING CONDUIT AND JUNCTION BOXES**

- A. Reuse existing conduit (in-place) and junction boxes when NEC requirements and Department standards for conduit material and depth of cover can be met as specified by the Engineer.~~no new adjacent conduit is being installed.~~
- B. ~~Reuse only existing conduit that meets NEC requirements and Department standards for conduit material and depth of cover.~~
- C. ~~Replace existing plastic lid on all reused junction boxes with polymer concrete lid. Refer to Section 013554.~~

### **3.109 ABANDON ATMS EQUIPMENT FACILITIES IN PLACE**

- A. Do not remove existing pull wire from conduit that is to be abandoned in place.
- B. Obliterate all existing foundations left in place to a depth of at least 6 inches below the existing surface. Properly dispose of removed concrete.
- C. ~~Properly label "abandoned" each piece of abandoned ATMS equipment in each junction box and all cables and conductors that are left in place. Remove all conductors, except pull wires, being taken out of service. Cut the ends even with the end of pipe if abandoning in place.~~

### **3.110 REMOVE AND SALVAGE ATMS EQUIPMENT**

- A. Remove existing equipment as specified.
  - 1. Maintain the integrity of the equipment during removal and transport. Contact the Engineer 48 hours before removal to arrange for an

Department inspection ~~by the Department~~ to verify Equipment condition ~~prior to removal~~, otherwise the equipment will be assumed functional and undamaged. Replace ~~D~~amaged equipment will be replaced at no additional cost to the Department.

2. Return equipment to the appropriate Department facility, as indicated by the Engineer.

~~3. Contact Engineer at least 48 hours prior to removal.~~

- B. All ~~removed-salvageable~~ poles and cabinets:

1. Contact the Engineer at least 48 hours before removal~~prior~~.
2. Return to appropriate Department facility.

- C. Cable and wiring:

1. Spool all cable to be salvaged neatly onto appropriately sized spools. Avoid cutting long cables whenever possible. Cut cables only at splice locations or as directed by the Engineer. Cap wires as described in this Section, Article 3.1~~32~~.
2. Do not exceed the minimum bending radius and the maximum pulling tension recommended by the manufacturer's specifications at any time.

### **3.1~~24~~ ELECTRICAL**

- A. Perform all work in accordance with the National Electrical al Code (NEC), National Electrical Safety Code (NESC), and International Building Code (IBC).

### **3.1~~32~~ INSTALL WIRING**

- A. Conductors:

1. Clean and dry the inside of the conduit before installing conductors.
2. Install grounding conductor in all power circuit conduits (Refer to NEC, Article 250.1).
3. Use ~~powered soapstone, talc or other~~ NEC approved lubricants when pulling conductors in conduit.
4. Tape and seal the ends of unused conductors and label them as spares.
5. Use conductors that are color coded as specified in ~~IMSA-20-1~~ and comply with NEC, Article 310.

- B. Ground wire:

1. ~~In all non-metallic conduit, a~~ Ground wire in non-metallic conduit must run continuously and be grounded at each junction box, except in those conduits used solely for interconnect and detector circuits.
2. Bond the ground wire to the ground rod in each junction box ~~except in circuits with less than 50 V.~~

- C. Neatly arrange and support wiring within cabinets, junction boxes, fixtures, etc.
- D. Wire splicing:
  - 1. Splice wires only in detection circuits where the wire type changes in the junction boxes.
  - 2. Mechanically secure and solder, individually insulate, and water seal all splices. ~~Encapsulate in a rigid body re-enterable gel filled enclosure approved by the department.~~
- E. Do not exceed the minimum bending radius or the maximum pulling tension recommended by the manufacturer's specifications at any time.
- F. Keep cable ends sealed at all times during installation using an approved cable end cap. Do not use tape to seal the cable end. Keep cable end sealed until connectors are installed.

### 3.143 MAINTENANCE OR REPAIR

- A. Repair, replace, maintain and operate all installed ATMS devices until Final Acceptance. Includes but is not limited to:
  - 1. Replacement of damaged cabling.
  - 2. Repair or replacement of damaged conduit and junction boxes.
  - 3. Repair or replacement of Department and Contractor furnished items.
- B. Repair installation or replace equipment due to any damage as specified in Section 00725.
- C. Emergency Maintenance: Until Final Acceptance of the ATMS device, provide emergency maintenance on a seven-day per week, twenty-four hour basis. Respond to the dispatcher within fifteen-15 minutes when called or paged by the dispatcher. Provide contacts and telephone numbers to the Engineer for the emergency service.
- D. Limit emergency maintenance-repair response (one hour response maximum) to problems of a public safety nature, such as exposed wires or knockdowns.
- E. ~~Routine Maintenance~~Non-emergency repairs: Initiate other routine maintenance non-emergency repairs; ~~not of a public safety nature~~, within twenty-four~~24~~ hours of notice.
- F. Failure to provide adequate routine or emergency maintenance-repairs will result in the Department itself performing making the necessary maintenance-repairs, or through a separate contractor. or the selection a separate contractor by the Department to perform the work. The Contractor will be charged accordingly.

### ~~3.145 LOCATION OF NEW FACILITIES~~

- ~~A. Locations staked in the field and dimensioned on the plans and details are approximate. Coordinate with the Engineer to have the Engineer or the Engineer's Agent on site to field locate all new facilities such as cabinet foundations, camera poles, detector poles, and junction boxes.~~

END OF SECTION

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**SECTION 13552M**

**RAMP METER SIGNALS AND SIGNING**

**Delete Article 1.1 paragraph A and replace with the following:**

- A. ~~Furnish and~~ Materials and procedures for installing conduit, junction boxes, signal heads, signing, mounting brackets, wire, grounding, and foundations. Install all state furnished items. Includes all materials, labor, workmanship, equipment, testing, documentation, and incidental items required to install and test a complete and operational Ramp Meter system as shown ~~on the plans and details in the~~ contract.

**Delete Article 1.3 and replace with the following:**

- A. AASHTO Standard Specifications for Highway Bridges
- B. AASHTO Standard Specifications for Highway Bridges: Division II - Construction, Section 5: Drilled Piles and Shafts
- C. AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (current edition)
- D. American Iron and Steel Institute (AISI)
- E. American National Standards Institute (ANSI)
- F. Manual on Uniform Traffic Control Devices (MUTCD)
- G. National Electrical al Code (NEC)
- H. Underwriters Laboratories (UL)



**Delete Article 1.4 and replace with the following:**

#### **1.4 SUBMITTALS**

- A. Provide samples of materials to the Engineer for approval when requested.
- B. Provide all of the following submittals as described in Section 13551:
  - 1. Contractor Furnished Material and Equipment Lists
  - 2. Test Reports for the Cable & Conductor Test, the Local Field Operations Test, and the Thirty-Day Burn-In Test
  - 3. Completion Notice
  - 4. Compliance Certificate
  - 5. Manufacturer's Equipment Documentation
  - 6. As-Built Drawings

**Delete Article 2.2 and replace with the following:**

#### **2.2 RAMP METER POLE MOUNT SIGNAL ASSEMBLY**

- A. One 8-inch ~~4~~ section signal head with red LED Module for enforcement. No back plate required.
- B. ~~For a~~ All signal heads: Refer to Section 02892. Louvered back plate required.
- C. Regulatory Sign: MUTCD R10-6; 24-inch x 36-inch.
- D. ~~24-inch x 18-inch~~ 1 VEHICLE PER GREEN and 2 VEHICLES PER GREEN Signs: 24 inch x 18 inch. Refer to AT ~~series~~ Series Standard Drawings.
- E. All signal head housings: ~~yellow~~ Highway Yellow with hoods.
- F. Signal Pole: Refer to Section 02892 and SL ~~series~~ Series Standard Drawings.
- ~~G. Foundation Concrete: Class AA(AE) Concrete (Refer to Section 03055).~~
- HG. ~~Provide two~~ Two "Z" bars on the back of the sign to support against thrown snow. Refer to ~~SL-SN~~ Series Standard Drawings.

**Delete Article 2.3 and replace with the following:**

#### **2.3 RAMP METER MAST ARM SIGNAL ASSEMBLY**

- A. ~~For~~ All 12-inch signal heads: Refer to Section 02892. Louvered back plate required.

B. ~~60-inch x 36-inch~~ 1 VEHICLE PER GREEN EACH LANE and 2 VEHICLES PER GREEN EACH LANE Signs: 60 inch x 36 inch. Refer to AT ~~series~~ Series Standard Drawings.

C. All signal head housings: ~~yellow~~ Highway Yellow with hoods.

D. Signal Pole: Refer to SL ~~series~~ Series Standard Drawings.

~~E. Reinforcing Steel: Coated steel (Refer to Section 03211).~~

~~F. Concrete: Class AA(AE) Concrete (Refer to Section 03055).~~

**Delete Article 2.4 and replace with the following:**

## **2.4 ADVANCE FLASHING BEACON SIGN**

A. Two 8-inch signal heads with yellow LED Module: Refer to Section 02892. No back plate required.

B. Warning Sign: MUTCD WS3-3, 36-inch x 36-inch. Refer to AT Series Standard Drawings.

C. METERING WHEN FLASHING Sign: 30-inch x 24-inch black on yellow. ~~METERING WHEN FLASHING Sign:~~ Refer to AT ~~series~~ Series Standard Drawings.

D. All signal head housings: ~~yellow~~ Highway Yellow with hoods.

E. Signal Pole: Refer to Section 02892 and SL ~~S~~ series Standard Drawings.

~~F. Foundation Concrete: Class AA(AE) Concrete (Refer to Section 03055).~~

~~GF.~~ Provide two ~~Two~~ “Z” bars on the back of the sign to support against ~~snow plow activity~~ thrown snow. Refer to ~~SL-SN~~ Series Standard Drawings.

**Delete Article 2.5 and replace with the following:**

## **2.5 BOLTS AND NUTS**

A. Follow Section 02892.

B. Follow Section 13551 for Anchor Bolts.

**Delete Article 2.6 and replace with the following:**

## **2.6 WIRE**

- A. ~~Provide one 7-conductor signal cable to each signal head.~~ Follow ~~section~~ Section 02892 for signal cable specifications.

**Delete Article 2.7 paragraph B.**

**Add the following to Article 2.8:**

- C. Use 240-volt 400 watt luminaries ~~if 480-volt power service is not available.~~

**Delete Article 3.1 paragraph A and replace with the following:**

- A. Load, transport, and install all state-furnished materials per the manufacturer's instructions and as shown in the contract.

**Delete Article 3.1 paragraph C and replace with the following:**

- C. Install all wiring, conduit, and junction boxes as shown in the contract.
  - 1. Field locate all conduit and junction boxes to avoid drainage areas and steep slopes whenever possible.
  - 2. Protect existing conductors while installing new conductors.

**Delete Article 3.1 paragraph F and replace with the following:**

- F. Clean equipment exterior of all rust and mill scale, dirt, oil, grease and other foreign substances after installation.

**Delete Article 3.2 and replace with the following:**

## **3.2 FOUNDATION**

- A. Conform to AASHTO's Standard Specifications for Highway Bridges for all material and workmanship.
- B. ~~Prior to work, v~~Verify that the installation locations of the signal heads, mast arm, pole, and foundation ~~in the location marked in the field~~ haves no conflict with existing utilities, ~~underground and overhead~~ before work. Comply with all utility and Blue Stakes requirements.

- C. See AT Series Standard Drawings for ramp meter signal assembly and advance flashing beacon assembly details and placement.
- D. ~~Excavation~~Excavate for foundations. Refer to Section 13551.
- E. Construct caissons to conform to AASHTO Standard Specifications for Highway Bridges: Division II - Construction, Section 5: Drilled Piles and Shafts. If formwork is required during drilling, the forms may be withdrawn during concrete placement.  
~~Drill caissons into either native soil or compacted fill.~~
  - 1. Drill caissons into either native soil or compacted fill.
  - 2. ~~If formwork is required during drilling, the forms may be withdrawn during concrete placement.~~
  - 2. ~~Cast the top of the caisson against the formwork for appearance.~~
- F. Place concrete directly into the excavation. Use minimum forming.
- G. Tie reinforcing steel and conduit securely in place. Do not weld reinforcing steel, conduit, or anchor bolts; ~~tie reinforcing steel and conduit securely in place.~~
- H. Install ~~RR~~Reinforcing ~~SS~~Steel according to Section 03211.
- I. ~~Use Class AA(AE) for all cast in place concrete.~~ Cap all conduits before placing concrete.
- J. Install weep hole in foundation per SL ~~series~~Series Standard ~~drawings~~Drawings.

**Delete Article 3.4 paragraph C and replace with the following:**

- C. Install ground rod per contract (NEC 250).

**Delete Article 3.8 paragraphs B through E and replace with the following:**

- ~~B.~~ B. ~~Cover signal heads with non-transparent, non-paper material tied securely around head if turn-on is not immediate.~~
- ~~EB.~~ Install directed and veiled optically programmed signals following the manufacturer's instructions. Mask each section of the signal with ~~recommended~~ manufacturer's recommended materials.
- ~~DC.~~ Use louvered back plates on those signal heads indicated. Use a minimum of four 0.12-inch stainless steel screws per section to mount the back plates, or according to manufacturer's instructions.

- ~~E~~D. Install ~~meter-on~~ ramp meter signal head toward vehicles approaching the intersection stop-bar. Side Signal Head: axis or indication parallel to roadway surface.

**Delete Article 3.9 paragraphs B and C and replace with the following:**

- B. Refer to AT sSeries Standard Drawings for location of Presence and Discharge Loop.
- C. Consult the Engineer for saw cut loops: ~~circular or octagon shaped~~.

**Delete Article 3.11 paragraph B and replace with the following:**

- B. Perform the Local Field Operations Test after all ramp meter elements, equipment and hardware, power supply, detection device (Refer to Section 13591) and connecting cabling have been installed.
1. Complete the Local Field Operations Test for Ramp Meters using the required form. Obtain UDOT's newest version at time of bid of the form from the UDOT Web site. Refer to  
<http://www.udot.utah.gov/index.php/m=c/tid=719>. Refer to  
<http://www.dot.utah.gov/index.php?m=c&tid=332><http://www.udot.utah.gov/index.php/m=c/tid=719>.
  2. Perform testing after all construction for the site has been completed and the final road surface has been constructed.
    - a. It is not necessary for the communications installation to be completed at the time of testing.
    - b. It is not necessary that all stations be ~~locally~~ tested concurrently.

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**SECTION 13553**

**ATMS CONDUIT**

**Delete Section 13553 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.    Materials and procedures for ~~Furnish and installing~~ conduit as ~~shown on the plans and details specified in the contract.~~ Unless otherwise specified, install conduit by trenching, boring, or plowing.
- ~~B.    Includes locate wire with associated 1-inch~~ 1-inch conduit.
- ~~C.B.~~    Includes Locatable Mulepull Tapetape, locate wire, and all materials, labor, workmanship, equipment, and incidental items required for a complete system of conduit.

**1.2      RELATED SECTIONS**

- A.    Section 00725: Scope of Work
- B.    Section 01721: Survey
- C.    Section 02061: Select Aggregate
- D.    Section 02705: Pavement Cutting
- E.    Section 02741: Hot Mix Asphalt (HMA)
- F.    Section 02776: Concrete Sidewalk, Median Filler, and Flatwork
- G.    Section 02892: Traffic Signal
- H.    Section 03575: Flowable Fill
- I.    Section 13554: Polymer Concrete Junction Box

## 1.3 REFERENCES

- A. ASTM D 2241: Standard Specification for Poly-Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
- B. American National Standards Institutes (ANSI)
- ~~C. American Wire Gauge (AWG) (Reference removed, 2.1 J)~~
- ~~D. American National Standards Institutes (ANSI) (Duplicate)~~
- ~~E. International Municipal Signal Association (IMSA) Standards (Reference removed, 2.1 J)~~
- ~~CF.~~ National Electrical Code (NEC)
- ~~DG.~~ National Electrical Manufacturers Association (NEMA)
- ~~EH.~~ Railroad Specifications
- ~~FL.~~ Underwriters Laboratory (UL)

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Conduit and Fittings:
  - 1. Schedule 40 PVC rated at 194 degrees F, as specified. NEMA TC-2, NEMA TC-3, ASTM D 2241, UL Listed
  - 2. HDPE (High Density Polyethylene) SDR11 rated, as specified. ASTM D 2241
  - 3. Rigid steel as specified (UL-6)
  - 4. Galvanized as specified (ANSI C80.1)
- B. ~~Non-Metallic Multi-Conduit~~
  - 1. New, prefabricated.
  - ~~2. Minimum of 4 each 2-inch conduit.~~
  - ~~3. Label: FIBER OPTIC COMMUNICATIONS, permanent 1/2-inch black letters, every 6 ft on the outside of each conduit.~~
  - 42. ATMS Multi-duct Conduit Types
    - a. 1D = ~~4~~four 2-inch conduits
    - b. 2D = ~~8~~eight 2-inch conduits
    - c. 4D = ~~16~~sixteen 2-inch conduits

53. Color code each conduit or cell as follows:

a. One, two or three conduits: gray

b. 1D:

Bank 1: ~~one conduit of~~ blue, orange, green and brown

~~bc.~~ 2D

Bank 1: ~~one conduit of~~ blue, orange, green, and brown

Bank 2: ~~one conduit of~~ slate, white, red, and black

~~ed.~~ 4D

Bank 1: ~~one conduit of~~ blue, orange, green, and brown

Bank 2: ~~one conduit of~~ slate, white, red, and black

Bank 3: same as bank 1 with a stripe of contrasting color

Bank 4: same as bank 2 with a stripe of contrasting color

C. Meet or exceed all of the conduit manufacturer's recommendations for all materials. ~~Provide a~~ All materials used in the installation of conduits, such as sweeps, adapters, couplings, glue, plugs, and fittings, ~~are to meet or exceed all of the recommendations of the conduit manufacturer for suitable installation.~~ Conduit plugs must be capable of sealing seal the sized conduit and allowing the secure fastening of locatable pull tape.

~~D. Provide special termination kits from the conduit manufacturer for terminating the conduit in vaults and junction boxes. Provide kits that form a watertight seal of conduit to structure wall.~~

~~ED.~~ Use complete PVC conduit sections: ~~in~~ nominal 20 ft sections; couplings and fittings to provide for watertight integrity.

~~FE.~~ Use Sweeps: complete conduit manufactured ~~36-inch radius~~ sweeps (1 1/4, 2 1/2, 45, and 90 degree angles) complete with bell and spigot. ~~Do not field bend conduit.~~

~~GF.~~ Provide Pull Tape: flat profile, low stretch polyester, locatable, sequential footage marked, ~~2500-1,200 lb.~~ tensile strength Mule Tape ~~pull tape or approved equal,~~ in each empty conduit ~~or cell.~~

~~HG.~~ Provide fiber optic and electrical buried cable marker warning tape ~~that meets the following requirements:~~

1. Material: Composite reinforced thermoplastic.
2. Tape Color: Orange (communication) or Red (electric).
3. Text: Caution Buried Communication Cable or Caution Buried Electric (front and back).
4. Maximum distance between text: 5 feet.
5. Text Color: Black.
6. Width: 3-inch minimum (face or diameter).



~~HI.~~ ~~Provide-Locate wire: #14 THWN solid green 1-green insulated IMSA 51-3 #14 locator wire in all conduit with new fiber optic cable. in 1-inch conduit in each trench where ATMS Conduit is installed. Place the locator wire conduit at the top of all other conduit in the trench as shown in AT series Standard Drawings. Install locator wire in existing non-multiduct conduit where new fiber optic cable is to be installed.~~

~~J.~~ ~~Provide locator wire connection device that meets the following requirements:~~

- ~~1. Screw clamp connection type~~
- ~~2. Suitable for 22 to 8 AWG~~
- ~~3. Rated 50 Aamps~~
- ~~4. Rated 600 V~~
- ~~5. Zinc bichromate plated steel mounting rail for locator wire connection device~~

~~KI.~~ Backfill

1. Flowable Fill: Refer to Section 03575.
2. Free Draining Granular Backfill Borrow: Refer to Section 02061.
3. Native material: 96 percent compaction.

~~J.~~ ~~Submit Aall material certifications to be submitted to the Engineer for approval.~~

## **PART 3 EXECUTION**

### **3.1 GENERAL**

A. Plans depict conduit routing in schematic form only. Base final routing on actual field conditions at the time of construction, including Blue Stake markings, to prevent conflicts with existing utilities.

B. Do not place conduit directly above parallel utilities.

C. Obtain appropriate permits before work commences.

D. Record longitudinal and depth GPS coordinates (x,y,z) of conduit according to Section 01721 and show on as-built drawings.

E. All conduit crossing of roadways will be done by boring. All surface street conduit installation will be done by boring. Where curb and gutter is present, install conduit under park strip

F. Maximum spacing between junction boxes is as follows:

1. 1,000 ft for tangent surface street installations

2. 2,500 ft for tangent highway installations
3. Reduce maximum spacing if horizontal or vertical deflection prevents the installation of cable within maximum tensile rating of the cable or location wire.

G. Conduit under Railroad Right-of-Way: Refer to Section 00725 and appropriate railroad specifications, such as Union Pacific Railroad, Standard Specifications:

1. Coordinate all work with appropriate Railroad personnel.
2. Complete Railroad Safety Training.

H. Minimum Cover of Conduit:

1. Minimum cover in sidewalks or paved surfaces: 3 ft.
2. Minimum cover in highway right-of-way, greater than 20 ft from the edge of the pavement: 3 ft.
3. Minimum cover in highway right-of-way, within 20 ft of the edge of the pavement: 5 ft.

I. DEPARTMENT will not grant additional time or money for installing conduit in difficult subsurface conditions.

J. Obtain approval from the Department on conduit splice connectors before use.

### **3.12 INSTALLATION**

~~A. Plans depict conduit routing in schematic form only. Base final routing on actual field conditions at the time of construction, including Blue Stake markings, to prevent conflicts with existing utilities.~~

~~BA.~~ When installing conduit that houses communication cable, do not allow conduit to deflect vertically or horizontally along its length by a ratio greater than 10:1, (e.g. no more than 4-inch deflection per 40 inch in length).

~~CB.~~ When installing conduit, do not allow the sum total of the vertical and horizontal deflection of conduit and bends between any two junction boxes to exceed 270 degrees.

~~D. Do not place conduit directly above parallel utilities.~~

~~EC.~~ Locate conduit within 1 ft of existing parallel conduit run if the planned location of conduit is parallel to the existing traffic signal or ATMS conduit. Refer to Section 02892.

~~FD.~~ Do not field bend conduit. Install all conduit bends to have a radius that is not less than the following:

1. 24 inches within the cabinet and pole foundations
2. 36 inches in all other locations

~~GE.~~ Install conduits that cross finished curbs and gutters, sidewalks, concrete flatwork, textured or decorative surfaces by boring, jacking, or drilling. Entirely replace any damaged concrete sections, joint to joint, at no additional cost to the Department.

~~H.~~ ~~Obtain appropriate permits before work commences.~~

~~HF.~~ Conduit Stub

1. Install conduit in a junction box per Section 13554 to allow for the continuation of a conduit run. Type and number of conduits as specified in the contract, shown on details.
2. Extend conduit stub to 10 feet from the junction box in line with the conduit run as specified in the contract, as shown on the Plans and Details.

~~JG.~~ Proof all conduits with an approved mandrel prior to before installation of cabling and Mule Tape locatable pull tape.

~~K.~~ ~~Record longitudinal and depth GPS coordinates (x,y,z) of conduit according to Section 01721 show.~~

~~LH.~~ ~~Install Provide locatable Mule Tape pull tape in all empty conduits, including all cells of multi-duct conduit.~~

- ~~1.~~ ~~Install plug with 1/4 inch hole for Mule Tape pull tape on each end of conduit.~~
- ~~12.~~ Fasten securely to plug and leave 32 ft of Mule Tape pull tape slack outside of the conduit plug and fasten securely to plug.
- ~~23.~~ Do not splice locatable Mule Tape pull tape in conduit.
  - a. Locatable Mule Tape pull tape is sequentially numbered
  - b. Must be continuous between junction boxes

~~MI.~~ Place all conduit that is encased in a structural member per current Uniform Building Code and ~~or~~ as approved by the Engineer.

~~N.~~ ~~Secure conduit on structures with standard galvanized iron conduit clamps using at least 5/16 inch diameter concrete expansion anchors at a maximum of 5 ft spacing.~~

~~OJ.~~ Secure conduit on concrete structures with standard galvanized steel conduit clamps using an approved anchoring system. Install per manufacturer's requirements. Use waterproof conduit expansion fittings at structure expansion joint crossings.

**PK.** Fill all new and existing conduit to ~~less than~~ maximum of 40 percent as per NEC.

**Q.** ~~Maximum spacing between junction boxes is as follows:~~

- ~~1. 1,000 ft for tangent surface street installations~~
- ~~2. 3,000 ft for tangent highway installations~~
- ~~3. Reduced maximum spacing if horizontal or vertical deflection prevents the installation of cable within maximum tensile rating of the cable or location wire.~~

**RL.** ~~Locator Wire:~~

- ~~1. Install #14 THHN solid green locator wire continuously in 1-inch conduit where new fiber optic cable is installed and bond to grounding rods within each junction box.~~
- ~~2. Mount locator wire connection device to the sidewall of each junction box using a mounting rail (Refer to Section 13554).~~
- ~~3. Connect the locator wire to the terminal block and connect the terminal block to the ground rod.~~

**M.** Encase all open trench conduit in flowable fill. Encase plowed and bored conduit in flowable fill at exposed locations, splice points, and junction box connections.

**N.** Use galvanized rigid steel conduit for above ground application; use PVC or HDPE conduit for underground application. Apply corrosion protection per NEC Article 346 to any portion of galvanized rigid steel conduit buried in the ground or encased in concrete.

**O.** Warning Tape:

1. Install orange warning tape with black legend CAUTION - BURIED COMMUNICATION CABLE, in all trenches containing multi-duct conduit or conduit containing communication cables.
2. Install red warning tape with black legend CAUTION - BURIED ELECTRIC in all other trenches.
3. Not required when flowable fill is directly overlaid with asphalt pavement or PCCP.
4. Not required when boring conduit.

**P.** Install a bushing or adapter at ends of all nonmetallic conduit that contains a conductor per NEC Article 346, ~~in order to protect the conductor from abrasion.~~ Install rounded bushings on the ends of metal conduit per NEC Article 347.

**Q.** Install manufactured sweeps (11-¼, 22-½, 45, and 90 degree angle) with conduit compatible bell and spigot ends. Do not field bend conduit.

- R. Minimum separation between all conduit is 1-1/2 inches. The separation between individual conduits within a single bank of multi-duct conduit is permitted to be closer.

### 3.23 ATMS CONDUIT IN TRENCH~~TRENCH FOR ATMS CONDUIT~~

- A. Paved Surface (asphalt concrete):
1. Install T-patch over trenched area according to AT Series Standard Drawings.
  2. Cut pavement from roadway surface to roadway base on both sides of trench to provide a clean, straight wall for T-patch, ~~prior~~before ~~to~~ any backhoe use per Section 02705.
  3. Refer to AT series Standard Drawings for depth of flowable fill under paved surfaces.
  4. ~~Minimum soil compaction~~Compact soil under pavement ~~to at least~~: 96 percent.
  5. Evenly apply tack coat ~~before~~on final backfill before installing T-patch.
  6. Restoration patch: match the composition, density, and elevation ( $\pm 1/4$  inch), of the existing surface per Section 02741.
  7. Apply a hot-pour rubberized asphalt joint sealant or approved equal after the patch is installed.
- B. Sidewalk or Decorative Pavement.
1. Use flowable fill to bottom of new pavement.
  2. Match existing pavement thickness, but new pavement thickness must be within 3-1/2"  $\pm$  1/2" inches minimum, to 6-8 inches maximum. -of the existing roadway surface, depending on the existing pavement thickness.
  23. ~~Minimum soil compaction~~Compact soil under pavement: ~~to at least~~ 96 percent.
  34. Restore sidewalk or decorative pavement to original condition or better after work is completed per Section 02776.
- C. Unpaved Surface:
1. Use backfill that matches the composition, density, and elevation ( $\pm 0.2$  inch), of the existing surface per Section 02776.
  2. Dispose of surplus material daily.
  3. Use flowable fill from bottom of trench to 3 inches es above top conduit.
- ~~D. Conduit under Railroad Right of Way: Refer to Section 00725 and appropriate railroad specifications, such as Union Pacific Railroad, Standard Specifications:~~
1. ~~Coordinate all work with appropriate Railroad personnel.~~
  2. ~~Complete Railroad Safety Training.~~
- ~~E. Minimum Cover of eConduit:~~
1. ~~Minimum cover in sidewalks or paved surfaces: 3 ft.~~

- ~~2. Minimum cover in highway right of way, greater than 20 ft from the edge of the pavement: 3 ft.~~
- ~~3. Minimum cover in highway right of way, within 20 ft of the edge of the pavement: 5 ft.~~

~~F. Warning Tape:~~

- ~~1. Install orange warning tape with black legend CAUTION BURIED COMMUNICATION CABLE, in all trenches containing multi-duct conduit or conduit containing communication cables.~~
- ~~2. Install red warning tape with black legend CAUTION BURIED ELECTRIC in all other trenches.~~
- ~~3. Not required when flowable fill is directly overlaid with asphalt pavement or PCCP.~~
- ~~4. Not required when boring conduit.~~D. Sleeve foreign utilities that crosses a trench so that utilities are not encased in flowable fill.

### ~~3.3~~ **ATMS CONDUIT IN TRENCH**

~~A~~E. Place all conduits in the same trench whenever possible.

~~B.~~ Above ground use galvanized rigid steel; underground use PVC or HDPE. Apply corrosion protection per NEC Article 346 to any portion of galvanized rigid steel conduit buried in the ground or encased in concrete.

~~C~~F. ~~If flowable fill is used, e~~Encapsulate conduit ~~a minimum of at least~~ 3 inches above the top conduit with flowable fill. Continue flowable fill to the wall of the junction box to seal conduit entry into the junction box. Clean excess flowable fill from the inside of the junction box.

~~D~~G. Install all conduits so the flowable fill completely surrounds all exterior surfaces of the conduit. Separate multi-duct conduits using a commercially available conduit spacer or approved equivalent.

~~E.~~ Install a bushing or adapter at ends of all nonmetallic conduit that contains a conductor per NEC Article 346, in order to protect the conductor from abrasion. Install rounded bushings on the ends of metal conduits per NEC Article 347.

~~F.~~ Install manufactured sweeps (11 1/4, 22 1/2, 45, 90 degree angle) with conduit compatible bell and spigot ends. ~~Do not field bend conduit.~~

~~G~~H. ~~Prior to~~Before pouring placing flowable fill, anchor the conduit in trench, at 16 ft intervals, to maintain the required conduit depth during pour.

~~H. Minimum separation between all conduit is 1 1/2 .5 inches. The separation between individual conduits within a single cluster of multi duct conduit is permitted to be closer.~~

~~H.~~ Minimum separation between all conduit and the wall of the trench is 1-1/2 .5 inches.

~~J. Place the locator wire conduit on the plane of the uppermost conduit in the trench. The separation between the locator wire conduit and other conduit may be less than 1 1/2 .5 inches.~~

~~KJ.~~ In native earth, do not place flowable fill closer than ~~6~~8 inches to the finished grade.

### 3.4 ~~ATMS CONDUIT IN~~ DIRECTIONAL BORE OR PLOW

~~A. Obtain approval from the Department on conduit splice connectors before prior to use.~~

~~BA.~~ Follow all requirements for ~~ATMS Conduit in Trench~~ installation of flowable fill per this section, Article 3.3, at all exposed conduit locations and conduit splice locations ~~not~~ requiring junction boxes.

~~CB.~~ Contain and remove all drilling fluid outside the bore immediately. Contractor's estimate will not be processed until all drilling fluid outside the bore has been removed and properly disposed ~~of~~.

### 3.5 USE OF EXISTING OR OCCUPIED CONDUIT

A. Maintain the physical condition and functional integrity of all cabling and wiring in existing or occupied conduit.

B. ~~For Prior to i~~ installation of ~~fiber optic cable or wire~~ in an existing or occupied conduit:

1. Remove any existing fiber optic cable/copper wire ~~before installing cable.~~
2. Test the integrity and clean the conduit by successfully pulling a Department approved mandrel through the conduit ~~before prior to installing cable.~~
3. Re-pull ~~existing~~new and ~~existing~~new fiber optic cable/copper wire together.
4. Perform all necessary splices and replace any impacted fiber cable, spider fan-out kits, and locate wire.
5. Perform all additional ~~necessary~~ work ~~necessary~~needed to restore existing cable and conduit systems to original or better condition.

- C. Use existing conduit only in-situ and as approved by the Engineer or as specified in the contracts~~shown on design plans~~. Use new conduit on all new installations.;

### 3.6 REPAIR/RESTORATION

- A. Restore all areas, including landscaping, concrete pavement, asphalt, finished curbs and gutters, box culverts, sewers, underground water mains, sprinkler systems, sidewalks, concrete flatwork, and textured or decorative surfaces, ~~that were~~ damaged during conduit and junction box installation.
- B. Coordinate with local utilities for utility repair. ~~Advise~~Notify the Engineer of all necessary repairs.

END OF SECTION



Supplemental Specification  
2005 Standard Specification Book

SECTION 13554

**POLYMER CONCRETE JUNCTION BOX**

Delete Section 13554 and replace with the following:

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.    ~~Furnish and~~ Materials and procedures for installing polymer concrete junction boxes, ground rods, and maintenance markers. Includes Type I, Type II, and Type III Polymer-Concrete junction boxes.

**1.2      RELATED SECTIONS**

- A.    Section 01721: Survey
- ~~B.~~    Section 02056: Common Fill
- ~~BC.~~    Section 02061: Select Aggregate
- ~~CD.~~    Section 02842: Delineators
- ~~DE.~~    Section 02892: Traffic Signal
- ~~EF.~~    Section 03055: Portland Cement Concrete
- ~~G.~~    Section 03152: Concrete Joint Control
- ~~H.~~    Section 03575: Flowable Fill
- ~~FHIG.~~    Section 13551: General ATMS Requirements
- ~~J.~~    Section 13553: ATMS Conduit

### 1.3 REFERENCES

- A. [AASHTO H 20: NEED NAME](#)
- ~~B.~~ [ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars \(Using 2 inch or 50 mm cubes\)](#)
- ~~B.~~~~CB.~~ ASTM C 496: Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
- ~~C.~~~~DC.~~ ASTM C 579: Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
- ~~D.~~~~ED.~~ ASTM C 580: Standard Test Methods for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
- ~~FE.~~ [ASTM C 857-95: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures](#)
- ~~GF.~~ ASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method
- ~~FHG.~~ ASTM D 543: Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- ~~GH.~~ ASTM D 570: Standard Test Method for Water Absorption of Plastics
- ~~HJ.~~ ASTM D 635: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastic in a Horizontal Position
- ~~I.~~ ~~ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Insulating Materials~~
- ~~JKJ.~~ ASTM G 154: Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
- ~~KLK.~~ [ANSI/UL 467: Grounding and Bonding Equipment American National Standards Institute \(ANSI\)](#)
- ~~M.~~ [Underwriters Laboratory \(UL\)](#)

## PART 2 PRODUCTS

### 2.1 MATERIALS FILL

- ~~A. Provide special termination kits from the conduit manufacturer for terminating the conduit in junction boxes. Provide kits that form a watertight seal of conduit to structure wall or grout around the conduit. Finish grout smooth and flush with the interior wall.~~
- ~~B.A. Use fFree~~ draining granular backfill borrow per Section 02061.
- ~~C.B. Use gGranular~~ backfill borrow per Section 02056.
- ~~D.C. Provide maintenance markers for junction boxes along freeways and expressways. Use fFlowable fill per Section 03575.~~
- ~~E. Provide concrete Class AA(AE) for concrete collar. (Refer to Section 03055).~~
- ~~F. Provide pre-cast polymer concrete junction boxes. Refer to Standard Drawing AT 7 for per the dimensions size and of junction box types specified in the plans. Boxes are made from polymer concrete.~~
- ~~G. Use body, ring, and lid meeting the physical and chemical requirements listed in Table 1:~~

**Table 1**  
**Property**  
**ASTM Test**  
**Value**

<del>Compressive Strength</del>	<del>C-109</del>	<del>11,000 psi</del>
<del>Flexural Strength</del>	<del>D-790</del>	<del>7500 psi</del>
<del>Tensile Strength</del>	<del>C-496</del>	<del>1700 psi</del>
<del>Effects of Acids</del>	<del>D-543</del>	<del>Very Resistant</del>
<del>Effects of Alkalies</del>	<del>D-543</del>	<del>Very Resistant</del>

- ~~H. Provide all components with ultraviolet inhibitors per ASTM G-154.~~
- ~~I. Provide all components flame resistant per ASTM D-635.~~
- ~~J. Provide terminal block on a mounting rail for grounding locator wire to the ground rod.~~

## 2.2 JUNCTION BOXES AND LIDS

- A. Junction boxes: pre-cast polymer concrete. Refer to AT series Standard Drawings for dimensions of junction box types. ~~Provide junction boxes and vaults that resist water absorption in accordance with ASTM D 570.~~
- B. Furnish Select Junction Boxes for load rating as defined on AT series Standard Drawings, as follows:
1. ~~Load Rating 1: Incidental Vehicular Traffic~~
    - a. ~~In any paved area immediately adjacent to the mainline, such as shoulders, snow storage areas, or vehicle pullout areas, provide boxes, rings, and lids that sustain a minimum vertical test load of 33,500 lbs over a 10-inch x 20-inch square.~~
  2. ~~Load Rating 2: Non-wheel Loading Accessible~~
    - a. ~~In area not in traveled way, provide boxes, rings, and lids that sustain a minimum vertical test load of 22,500 lbs over a 10-inch x 20-inch square.~~ boxes, rings, and lids that sustain a minimum vertical test load of 33,500 lbs (AASHTO H-20 or Tier 22 loading) as a stand-alone unit, over a 10-inch x 20-inch square steel plate centered on the cover and body as per ASTM C-857 -95 design load A-16.
- C. ~~Provide a poured in place 1-inch thick grout floor, with a 1-inch diameter drain, for all type I, II, and III Polymer Concrete Junction Boxes or a box with a prefabricated floor with a 1-inch drain hole. Refer to ASTM C 579 and ASTM C 580 for test methods for grout.~~
- D. ~~Provide lid for all junction boxes as specified by application.~~
- C. Furnish Bbodies, rings, and lids shall that meet the physical and chemical requirements listed in Table 1:

Table 1

Physical and Chemical Properties of Junction Box Components		
Property	ASTM Test	Value
Compressive Strength	C 109	11,000 psi
Flexural Strength	<u>C 580</u>	<u>1,800 psi</u>
Tensile Strength	C 496	1,700 psi
Effects of Acids	D 543	Very Resistant
Effects of Alkalies	D 543	Very Resistant

- ~~E~~D. Furnish junction boxes that are tested according to the following ASTM testing procedures. Provide results upon request.
1. Ultraviolet Inhibitors: ASTM G 154
  2. Flame-Resistance: ASTM D 635
  3. Water Absorption Resistance: ASTM D 570

- E. Furnish lids that have a non-skid surface for pedestrian traffic with a minimum coefficient of friction of 0.50 per ASTM C 1028 without the use of coatings.~~Provide lids with a non-skid surface with minimum coefficient of friction of 0.50, per ASTM C 1028. Coatings will not be approved.~~
- F. Lids for all junction boxes are specified by application. Manufacture lids with the following markings in the logo area, in 1-inch recessed letters:
1. "Traffic Signal" when the junction box contains cables or wires for a traffic signal (Refer to Section 02892), CCTV, VMS, RWIS, WIM, ramp meter, traffic monitoring, or any other ATMS element (Refer to Section 13551).
  2. "Electric" when the junction box contains power conductors used for a traffic signal, CCTV, VMS, RWIS, WIM, ramp meter, traffic monitoring, or any other ATMS element.
  3. "Street Lighting" when the junction box contains street lighting conductors only. Inscribe "High Voltage" below the words "Street Lighting" when the junction box contains voltage above 600 V.
  4. "Communication" when the junction box contains multi-duct conduit for future use.
  5. "Sprinkler Control" when sprinkler control conduit enters the junction box.
- G. ~~Provide~~ Lid Access Points: ~~s with~~ recessed reinforced steel access point ~~pull slots~~ to allow removal of cover with a hook or lever. ~~Repair~~ Replace lid if damage occurs to the pulling point ~~in the lid~~.
- H. ~~Securing Bolts: Provide lids with vandal resistant~~ stainless steel recessed 3/16 ~~16 UNC stainless steel hex head~~ bolts with washer according to AT series Standard Drawings.

## 2.3 MAINTENANCE MARKERS

- A. ~~Steel~~ Fiber Glass posts: Orange. Refer to Section 02842.

## ~~2.4~~ BACKFILL

- ~~A. Compact free draining granular backfill borrow under junction boxes. Refer to Section 02061.~~
- ~~B. Compact granular backfill borrow around boxes. Refer to Section 02056.~~

## ~~2.5~~ CONDUIT PLUGS

- A. ~~Use eRefer to Section 13553 conduit plugs that have been specifically designed to seal the sized conduit used and allow that the secure fastening of locatable Mule Tape can be securely fastened to.~~

## **2.65 GROUND ROD**

- A. 8 ft x 5/8 inch Coppercopper-coated steel ground rod as specified.
- B. ~~by~~ by ANSI/UL 467

## **2.76 GROUND WIRE WIRING**

- A. Ground Wire: Refer to Section 13551.
- B. Locate Wire: Refer to Section 13553.
- C. Pull Tape: Refer to Section 13553.

## **2.7 CONCRETE COLLAR**

- A. Class AA(AE) concrete. Refer to Section 03055.

## **2.8 EXPANSION JOINT MATERIAL**

- A. ½ inch expansion joint material. Refer to Section 03152.~~Material~~

## **PART 3 EXECUTION**

### **3.1 BACKFILL**

- A. Compact~~Place~~ 12 inches of free draining granular backfill borrow under junction boxes. Refer to Section 02061.
- ~~Compact granular backfill borrow around boxes. Refer to Section 02056.~~
- ~~CB.~~ Hand tamp the granular backfill borrow material or approved compactable native soil around the junction box collar. Match the top 84 inches to the composition, density, and elevation of the surrounding surface.

### **3.21 JUNCTION BOX AND EXTENSION**

- A. Install per manufacturer's recommendations.
- B. Pre-C~~cast~~ conduit holes in junction box ~~at the time of precasting or~~ drill at the time of placement with no ~~structural~~ damage to the box. Use grout to ensure If grout is used to form thea watertight seal between conduit and the structure wall. Finish grout smooth and flush with the interior wall.
  - 1. Holes drilled in junction box must not be more than ¼-inch larger than conduit diameter.
  - 2. Seal conduit ends inside all junction boxes with at least 2-inch thick duct caulking after wires are installed.

3. Seal vacant conduit with a manufactured plug and attach pull tape according to (with locatable Mule Tape attached) designed for that purpose Section 13553.
- C. Place the top of the junction box flush with the surrounding grade or set at the planned finished grade.
- ~~D. Hand tamp the granular backfill borrow material around the junction box. Match the top 4 inches to the composition, density, and elevation of the surrounding surface.~~
- ~~ED. Do not install junction boxes inside of railroad right of way.~~
- ~~FED. Field-Field~~ locate junction boxes with engineers approval to avoid steep slopes and low lying locations with poor drainage.
- ~~GFE. Do not install junction boxes within the traveled way or, shoulders, or on approaches to signal poles.~~
- ~~HGF. Install bushings on end of all metallic conduits prior to before~~ cable installation.
- ~~IHG. Do not install conduit in corner of junction box or within 2 inches of corner of junction box. Extend all conduit a minimum of 2 to 6 inches and a maximum of 6 inches beyond the inside wall of the junction box. Align conduit ends by color at each side of the box. Refer to AT series Standard Drawings.~~
- ~~JH. Enter conduit through the sides of the junction box and not from the bottom. Place the conduit at least three inches above the floor in the bottom half of the junction box wall at least three inches above the floor.~~
- ~~KJ. Place the recessed access point in a location that provides both leverage and safety.~~
- ~~LKI. Saw cut concrete or other improved surfaces that require removal in the sidewalk area. Remove entire section of sidewalk. Replace with in-kind materials to match the existing grade.~~
- ~~MLJ. Provide 12 inches deep free draining granular backfill borrow (Refer to Section 02061) and fifteen 15 pound felt paper directly under junction box.~~
- ~~N.MKJ. Install Engineer-Engineer-approved 1/2-inch expansion joint material around entire periphery of ring for junction boxes installed in paved surface.~~



~~ONLK.~~ Record GPS coordinates for all junction boxes according to Section 1355401721 and show on as-built drawings.

~~OML.~~ ~~Install flowable fill around all conduits where they enter the junction box. Encase all conduit in flowable fill where conduit enters the junction box. Flowable fill shall fill all excavated areas where conduit is installed.~~

M. Provide a poured-in-place 1-inch thick grout floor, with a 1-inch diameter drain, for all ~~T~~type I, II, and III-Polymer Concrete Junction Boxes or provide a box with a prefabricated floor with a 1-inch drain hole. ~~Refer to~~Grout in accordance with ASTM C 579 and ASTM C 580 ~~for test methods for grout.~~

~~N.~~ ~~Do not stack boxes.~~

~~NO.~~ ~~Provide maintenance markers for junction boxes on freeways and expressways.~~

### 3.32 CONCRETE COLLAR

A. See AT series Standard Drawings.

B. Concrete: AA(AE) Refer to Section 03055.

C. ~~Do not install concrete collar for junction boxes in paved surface.~~ Install concrete collars around junction boxes in all ~~other~~ areas locations except where junction boxes are in concrete paved surfaces.

D. Secure ½-inch expansion joint material ~~to~~around the junction box before placing concrete collar.

### 3.43 GROUND ROD

A. Install ground rod to extend maximum 2 inches above box floor.

B. Attach ground wire, pull tape, ~~or and~~ locator wire to the ground rod with clamps.

### 3.54 RESTORATION

A. Restore all areas damaged during the installation of the junction boxes at no additional cost to the Department.

END OF SECTION

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**SECTION 13555M**

**ATMS CABINET**

**Add Article 1.3 paragraph E:**

- E. National Electrical ~~al~~ Code (NEC)

**Delete Article 2.1 paragraph A and replace with the following:**

- A. Concrete: AA(AE) required. Refer to Section 03055.

**Delete Article 2.2 paragraph B and replace with the following:**

- B. Provide commercially available framing strut to attach transformers, breaker enclosures, disconnects, or other electrical equipment (~~Refer to AT Series to enee~~ Standard Drawings-AT-9).
1. 12-gauge, U-shaped stainless steel product with  $\frac{5}{8}$ -inch diameter pre-drilled holes.
  2. Cross-section dimensions:  $1\frac{5}{8}$  inch x  $1\frac{5}{8}$  inch minimum.

**Add Article 2.4 paragraph B:**

- B. Minimum spacing from any edge of junction box to any edge of concrete collar must be 106 inches ~~minimum~~.

**Delete Article 2.7 and replace with the following:**

**2.7 EXPANSION JOINT MATERIAL**

- A.  $\frac{1}{2}$  inch ~~p~~Preformed expansion joint filler. Refer to Section 03152.

**Delete Article 3.1 paragraph C and replace with the following:**

- C. Restore area to the original condition ~~after ending construction prior to before~~ beginning work.

Delete Article 3.1 paragraph D

~~Delete Article 3.2 paragraph C. and replace with the following:~~

~~C. — Concrete: AA(AE) required. Refer to Section 03055.~~

~~Delete Article 3.2 paragraph G and replace with the following:~~

~~G. — Extend conduit 2 inches above the floor of the cabinet foundation.~~

Delete Article 3.2 ~~paragraph H~~ and replace with the following:

### 3.2 CONSTRUCT CABINET FOUNDATION

- A. Reinforcing Steel and Welded Wire. Refer to Section 03211.
- B. Verify bolt pattern, conduit runs, and foundation dimensions ~~prior to~~before foundation construction.
  - 1. Install anchor bolts to accommodate conduit runs.
  - 2. Embed strut anchor bolts a minimum of 6 inches into foundation.
  - 3. Embed cabinet anchor bolts a minimum of 6 inches into foundation.
- C. Concrete: ~~AA(AE) required.~~ Refer to Section 03055.
- D. Do not weld reinforcing steel, conduit, or anchor bolts.
  - 1. Use tie wire to secure conduits.
  - 2. Use template to align and secure anchor bolts.
  - 3. Locate steel, conduit, or anchor bolts a minimum of 3 inches from concrete edge.
- E. Place the concrete directly into the excavation. Use minimum forming above ground.
- F. Provide ~~36 inches~~ minimum ~~clearance~~setback between foundation and all walls, guardrails, poles, and other above ground features as per Section 13551.
- G. Extend conduit 2 inches above the floor of the cabinet foundation.
- H. Conduit:
  - 1. Install all conduit in base of cabinet in a 12-inch x 18-inch rectangle centered in the cabinet base.
  - 2. Refer to the ~~Project Plans~~contract for the number, size, and orientation of all conduits entering the junction boxes.

3. ~~3. Conduit (typical) for power from cabinet with disconnect to Type I junction box:~~
    - a. ~~One 1 1/2 inch from cabinet to disconnect.~~
    - b. ~~One 1 1/2 inch from disconnect to Type I junction box.~~
  4. ~~Conduit (typical) for power from cabinet with disconnect/step-down transformer to Type I junction box:~~
    - a. ~~One 2 inch from disconnect to Type I junction box~~
    - b. ~~One 1 1/2 inch from disconnect to transformer~~
    - c. ~~One 1 1/2 inch from transformer to cabinet~~
  5. ~~Conduit (typical) for communication from cabinet to Type II junction box:~~
    - a. ~~Two 3 inch~~
    - b. ~~Four 2 inch~~
  6. ~~Conduit (typical) for communication stubbed out of Type II junction box:~~
    - a. ~~Two 3 inch~~
    - b. ~~Four 2 inch~~
    - c. ~~One 3 inch (used as a spare conduit)~~
- Refer to AT series Standard Drawings for number and type of conduit used between the cabinet and adjacent junction boxes.
4. Above ground, use galvanized rigid steel; underground, use PVC.
  5. Install bushings on the ends of metallic all conduit prior to before cable installation. ~~Install end bells on non-metallic conduit.~~
  6. Provide 1 inch minimum spacing between each conduit in cabinet base. Cap conduit at both ends until used. ~~Stub conduit a maximum of 3 inches above the concrete base~~
- I. Place the cabinet foundation ~~to allow maintenance personnel facing the front door of the cabinet also face device (such as (VMS, CCTV, RMS, TMS))~~ parallel to the roadway-g., and.
  - J. Trowel finish the foundation surface, chamfer around the top of the cabinet, and level prior to before cabinet installation. After the concrete base has cured, leveling can only be accomplished by grinding the top surface.
  - K. ~~Bituminous~~ Place preformed expansion joint filler at concrete joints. ~~Refer to Section 03152.~~

**Delete Article 3.3 paragraph E and replace with the following:**

- E. Install caulk between base of cabinet and top of foundation ~~that to forms an~~ air/water- watertight seal.

**Add Article 3.3 paragraph F:**

- F. Orient cabinet on foundation with the vented door downstream of traffic.

**Delete Article 3.4 and replace with the following:**

**3.4    INSTALL DISCONNECT, ~~AND/OR~~ TRANSFORMER, OR BOTH**

- A.    Unless ~~specified on the plans~~otherwise specified, install either a supplemental disconnect as described on AT series Standard Drawings, or an approved underground service pedestal as described in the SL series Standard Drawings and in Section 13561.
- B.    Install disconnect or underground service pedestal between 10 and 15 feet from the cabinet, away from roadway. Field locate with the Engineer. Install the unit such that the door is downstream of traffic flow.
- C.    Ground disconnect on ground rod located in Type I junction box at the cabinet base.
- D.    Ground the transformer to the control cabinet ground terminal.
- E.    Install disconnect and transformer in accordance with AT Series Standard Drawings, SL Series Standard Drawings, and the NEC.

**Delete Article 3.6 paragraphs A and B and replace with the following:**

- A.    Refer to section 13561 for Power Service.

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**SECTION 13561**

**ATMS POWER SERVICE**

**Delete Section 13561 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A. ~~Furnish and~~ Materials and procedures for installing a complete electrical power service as shown in the contract. Includes all coordination with the power service provider, wires, surge protection, rigid metal riser, weatherhead, transformer, disconnects, conduit risers and stand-off brackets, breakers, clamps, conduit, junction boxes, grounding materials, duct seal, pull wire, locate tape, labor, workmanship, equipment, testing, documentation, and incidental items required for a fully operational system.
- B. ~~Furnish and~~ Materials and procedures for installing a Power Pole.

**1.2      RELATED SECTIONS**

- A. Section 02324: Compaction
- B. Section 13551: General ATMS Requirements 02324: Compaction

**1.3      REFERENCES**

- ~~A. — AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals~~
- ~~BA.~~ ASTM A 123: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ~~BC.~~ ASTM B 117: Operating Salt Spray (Fog) Apparatus
- ~~CD.~~ Electrical Utility Service Equipment Requirements Committee (EUSERC)

- ~~DE~~. Local utility electric service requirements
- ~~EF~~. National Electrical Manufacturers Association (NEMA) Standards
- ~~FG~~. National Electrical al Code (NEC)
- ~~GH~~. Underwriters Laboratories (UL)

## 1.4 SUBMITTALS

- A. In accordance with Section 13551.

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. Comply with NEC ~~regulations~~ standards, local utility electric service requirements and standards, and Department standards for all electric service products.
- B. Provide approved underground service pedestal. ~~Use a safety switch as indicated in SL series Standard Drawing for service pedestal.~~ Service Enclosures must be NEMA 3R rated. Refer to NEMA Standards Publication 250-1997.
- C. Use a safety switch as indicated in the contract.
- D. Provide circuit breakers sized as ~~indicated~~ specified in ~~the plans~~ contract.
- E. Conductors are to be provided as sized and numbered in the ~~specified in the plans~~ contract.
- F. Provide riser and weatherhead in ~~compliance~~ accordance with Department and local utility standards. Refer to SL series Standard Drawings.
- G. Provide approved blade or breaker disconnects as ~~shown~~ specified on plans and details in the contract.
- H. Provide MasterLock P848 Lock (provide two keys per lock to the Engineer), or disposable aluminum lock with break-off screws for all disconnects and service pedestals. ~~Provide two keys per lock to the Engineer.~~

I. Pole Mount (when approved by the power provider): Refer to SL series Standard Drawings

1. Service disconnect according to planscontract.
2. Provide a manual EUSERC approved circuit closing link by-pass release meter socket.
3. Unmetered street lighting circuit.

J. Underground Service Pedestal: As specified, ASTM B 117, and ASTM A 123 (Cabinet), UL E 50076.

1. Enclosure: 0.120 inch galvanized steel or anodized aluminum:
  - a. 0.080 inch galvanized steel or anodized aluminum covers.
  - b. Finished surface with an environmental green, baked enamel over zinc-chromate primer as specified, or anodized aluminum. ASTM B 117.
  - c. Bottom access opening.
  - d. ~~Electrical Utility Service Equipment Requirements Committee (EUSERC)~~ approved circuit-closing by-pass release meter socket.
  - e. Baffled ventilation louvers.

K. Circuit Breaker: Main Breaker

1. Six space metered.
2. Six space unmetered bus.

L. Detachable, pad-mount base.

M. Use copper conductor with stamped "RHH-USE-RHW" or "XHHW" rated insulation for all underground and riser electrical conductors

## 2.2 WOOD POWER POLE

~~K. Use copper conductor with RHH-USE-RHW rated insulation for all underground and riser electrical conductors.~~

A. ~~Power pole shall~~ Comply with local utility electric service requirements in selecting power pole.



## PART 3 EXECUTION

### 3.1 GENERAL

- A. Comply with NEC ~~regulations~~standards, local utility electric service requirements and standards, and Department standards for all electric service installations.
- B. Install underground service pedestal.
- C. Coordinate any utility connection with the Engineer and ~~contact the~~utility company. Contact at least 60 days before the desired connection date.
- D. Verify the exact location, voltage, procedure, and materials required by the utility company.
- ~~E. All underground and riser electrical conductors will be copper rated RHH USE RHW. Ground all electrical equipment, including cabinets, metal structures, in accordance with the NEC standards. requirements. Hard draw all ground wires.~~
- ~~F. Supply all conduit and conductors to power source connection location. Final connection is to be made by~~Have the power company make the final connection.

### 3.2 POWER SERVICE

- A. Contact the Engineer ~~a minimum of at least 6-six~~ weeks ~~prior to before~~ power service hookup to coordinate power service connection; and to confirm connection date.
- B. The Department will be responsible for all on-going electrical costs.

### 3.3 WOOD POWER POLE

- A. Install power pole as specified in the contract and in accordance with all Department and local utility standards. Contact the power company ten days before pole installation.
- B. Install wood pole below grade to a minimum depth equal to one-sixth the total pole height. ~~Refer to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, current edition.~~

C. Increase the installation depth by ~~one pole~~ diameter (~~measure~~ depth from the down-slope side of the pole) ~~when wood pole is installed on a slope of 2:1 or greater.~~

D. Backfill with native material in 1 ~~-foot~~ lifts to match surrounding grade. Tamp each lift to at least 90 percent compaction. Follow Section 02324 requirements for poles placed near structures.

END OF SECTION

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**SECTION 13591M**

**TRAFFIC MONITORING DETECTOR LOOP**

**Delete Article 1.3 paragraph B.**

**Delete Article 3.1 paragraph A and replace with the following:**

- A. The number of loops and the number of lanes varies based on location shown in the plans contract.

**Delete Article 3.2 paragraphs D and E and replace with the following:**  
**(Why is E included? No change. Barry)**

- D. ~~Maximum allowable~~Minimum distance between saw-cut and transverse joints, or between adjacent lead-in saw cuts: 1½ -ft.
- E. Loop Spacing: 21½ ft. ~~between leading edges.~~  
Maximum tolerance: 1 inch.

**Delete Article 3.3 paragraph A and replace with the following:**

- A. Follow Section 02892.

**Delete Article 3.3 paragraphs E and F and replace with the following:**

- E. Immediately upon installation, ÷  
~~1. Seal loop wire ends with waterproof coating, coil neatly, and, place in a junction box or a sealed plastic bag, and bury.~~  
~~2. Install a plywood shield above all buried wire ends.~~  
~~3. Do not allow Prevent extended exposure of loop wire ends be left exposed to the weather.~~
- F. Install Loop Sealant
1. Fill and encapsulate loop and lead-in wires ~~and home runs~~ a minimum depth of ~~1-5/8~~3 inches from the pavement surface.
  2. Install embedding loop sealant in saw cuts allowing ± ¼ inch from the top of the pavement after curing and expansion is complete.

3. Allow sealant adequate time to cure under ambient environmental conditions before lane is re-opened to traffic, ~~or cover loop sealant with sand or cement dust to minimize tire tracking.~~
4. Refer to manufacturer's specifications regarding expansion of sealant during curing period. Refer to Section 02892.

**Delete Article 3.3 paragraphs I and J and replace with the following:**

- I. Concrete Pavement Exit
  1. Drill 2-inch diameter hole at 45-degree angle ~~at pavement~~ 1 ft from concrete edge.
  2. Install conduit originating from splicing junction box to the pavement edge. Extend conduit 3 inches into drilled hole.
  3. After loop wires are installed, seal conduit, ~~and~~ fill the hole within 1½ ~~4/2~~ inches of road surface with silica sand.
  4. Seal remaining hole in the road surface with loop sealant.
- J. Conduit Connection to Junction Box
  1. ~~Conduit to be sealed~~ Seal conduit with waterproof bushings. Refer to Section 13553.
  2. Fill voids resulting from entrance of conduit into junction box with hydraulic cement grout. Refer to Section 13554.
  3. ~~Field locate junction box to avoid drainage areas and steep slopes.~~

**Delete Article 3.3 paragraph L. and replace with the following:**

- L. ~~Complete All work done in accordance with the National Electric Code (NEC).~~

**Delete Article 3.4 paragraphs A and B and replace with the following:**

- A. Perform a Detector Loop Inductance & Resistance Test as described in Section 02892. Obtain UDOT's newest version at time of bid of the (Detector Loop Inductance & Resistance Test form from the UDOT Web site. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719> ~~Refer to <http://www.dot.utah.gov/index.php?m=c&tid=332>~~. Submit Detector Loop Inductance & Resistance Test to the Engineer for acceptance.
- B. Perform the Local Field Operations Test before opening the lanes to traffic and after all Traffic Monitoring Detector Loop elements, equipment and hardware, power supply, and connecting cabling have been installed.
  1. Perform testing after all construction for the site has been completed and the final road surface has been constructed.
    - a. It is not necessary for the communications installation to be completed at the time of testing.
    - b. It is not necessary that all stations be ~~locally~~ tested concurrently.

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**SECTION 13592**

**ROADWAY WEATHER INFORMATION SYSTEM -  
ENVIRONMENTAL SENSOR STATION (RWIS-ESS)**

**Delete Section 13592 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      RWIS ~~S~~site ~~P~~preparation
  - 1. ~~\_\_\_\_\_~~ ~~÷~~ Install buried conduit in accordance with ~~per~~ industry standards ~~s.~~ and
  - 2. ~~\_\_\_\_\_~~ Install associated junction boxes with grounding rods, tower foundation, and fencing ~~installation per design plans, as specified in the contract~~ or as directed by a UDOT representative.

**1.2      RELATED SECTIONS**

- A.      Section 02324: Compaction
- B.      Section 02330: Embankment
- C.      Section 02776: Concrete Sidewalk, Median Filler, and Flatwork
- D.      Section 02821: Chain Link Fencing and Gates
- E.      Section 03055: Portland Cement Concrete
- F.      Section 03211: Reinforcing Steel and Welded Wire
- G.      Section 03310: Structural Concrete
- H.      Section 13553: ATMS Conduit
- I.      Section 13554: Polymer Concrete Junction Box

### 1.3 REFERENCES

- A. National Electrical al Code (NEC)
- B. ANSI/UL 467 American National Standards Institute (ANSI)
- C. Underwriters Laboratory (UL)

### 1.4 SUBMITTALS

- A. Provide a preliminary installation schedule to the Engineer 30 days before the start of work.

## PART 2 PRODUCTS

### 2.1 POWER

- A. Use electrical components as listed and defined by the National Electrical al Code (NEC).
- B. Supply and install ~~C~~conduit per Section 13553, junction boxes per Section 13554, and ground rods per Section 13554 and (NEC 250.4), and junction boxes per Sections 13553 and 13554. Install in each conduit a detectable pull tape. Refer to Section 13553.
- C. Use 4-inch schedule 40 galvanized pole for solar power only. Install solar power array and connect with RPU per manufacturer's specifications.

### 2.2 RPU TOWER FOUNDATION AND SERVICE PAD

- A. Obtain proper ~~C~~ompaction according to Section 02324
- B. Use Class AA (AE) concrete per Section 03055.
- C. Use 6-6-10-10 welded wire mesh per Section 03211.

### 2.3 TOWER GROUNDING SYSTEM

- A. Wire: Department State ~~f~~Furnished 32 strand, #210 weight,  $\frac{7}{16}$ -inch tinned copper ground cable. Refer to AT 17 Series Standard Drawings and NEC 250. For all three legs, starting from the outside ground rod, clamp wire and run wire to the

ground rod three feet from the tower. Clamp the wire to the ground rod. ~~DO NOT cut the wire.~~ Run the wire across the top of the concrete pad (Refer to Section 02776) to the corner of the RWIS tower. ~~Attach G~~grounding wire to ~~be attached to~~ the tower.

- B. Ground Rod: Furnish  $\frac{5}{8}$ -inch diameter 8-foot copper clad. ~~Two per corner; one, 3 feet away and one, 10 feet away.~~ Refer to AT Series Standard Drawings 17, NEC 250, and ANSI/UL 467.

## 2.4 ENVIRONMENTAL SENSORS, REMOTE PROCESSING UNIT (RPU), COMMUNICATION EQUIPMENT, AND RWIS TOWER

- A. ~~All sensors to be installed~~ Furnished by the Department State-Furnished.

## 2.5 FENCE AND GATE

- A. Furnish 7-foot high Type IV chain-link fence, with barbed wire and arm, and gate. Refer to FG Series Standard Drawings 6, AT Series Standard Drawings 15, and Section 02821. ~~Follow Department provided design specification.~~

## PART 3 EXECUTION

### 3.1 GENERAL

- A. Conform to the requirements of the National Electrical al Code (NEC).
- B. Tower site location and pavement sensor placement must be approved on site by the Engineer ~~prior to~~ before construction.
- ~~C. Provide a preliminary installation schedule to the Engineer 30 days prior to start of work.~~

- ~~C~~D. Notify the Engineer seven calendar days before desired pick-up of State-Furnished materials.  
Pick up SState ~~F~~furnished materials at the following:

~~Utah Department of Transportation  
Traffic Operations Center (TOC)  
2060 South 2760 West  
Salt Lake City, Utah 84104-4592~~

- ~~E~~D. Pick up State-Furnished materials at the following location:

Utah Department of Transportation

Traffic Operations Center (TOC)  
2060 South 2760 West  
Salt Lake City, Utah 84104-4592

~~Contact the Engineer seven calendar days before pick-up date.~~

E. Install conduit per Section 13553, junction boxes per Section 13554, and ground rods per Section 13554 and NEC 250.

~~FFE.~~ Install all State-furnished-Furnished materials per manufacturers' instructions, unless noted otherwise.

### **3.2 RPU TOWER FOUNDATION AND SERVICE PADTOWER**

A. Install concrete foundation and service pad. Refer to ~~Follow~~ Sections 03055 and 03211.

B. Provide all necessary grading for a flat and level site. Refer to Section 02330 if necessary.

C. Finish all surface concrete with Ordinary Surface Finish per Section 03310.

~~D. Embankments to be installed per Section 02330.~~

~~E. Do not weld conduit to tower. Follow manufacturers installation instructions.~~

~~F. Place the concrete directly into the excavation. Use minimum forming above ground.~~

D. RPU and tower installed by the Department.

~~G. RPU and tower to be installed by the Department.~~

### **3.3 TOWER GROUNDING SYSTEM**

A. Wire (Installed by the Department): ~~Installed by the Department.~~ Install one ground cable for each tower leg. Clamp wire to the outside ground rod (10 feet from tower leg) and run to the inside ground rod (3 feet from tower leg). Clamp wire to the inside ground rod. **DO NOT cut the wire.** Run the wire across the top of the concrete pad (Refer to Section 02776) to the corner of the RWIS tower. Attach grounding wire to the tower.

B. Ground Rod: Install as per AT Series Standard Drawings17.

### **3.43 PAVEMENTENVIRONMENTAL SENSORS**



- A. ~~To be installed by the~~ Installed by the Department ~~installed~~.

### **3.54 CABINET REMOTE PROCESSING UNIT (RPU)**

- A. ~~To be installed by the~~ Installed by the Department ~~installed~~.

### **3.65 COMMUNICATION EQUIPMENT**

- A. ~~To be installed by the~~ Installed by the Department ~~installed~~.

### **3.7 RWIS TOWER**

- A. Install tower base only. Refer to AT Series Standard Drawings 46.

### **3.86 FENCE AND GATE**

- A. ~~Furnish and install~~ cChain lLink fFence and gGate per Section 02821.
- B. ~~Furnish and install~~ 7-foot high Type IV fence, with barbed wire and arm, with and 5-foot wide gates per AT Series Standard Drawings 15 and FG Series Standard Drawings 6.
- C. ~~Install fence and fence gates following the dimensions and guidelines set forth and size the fence dimensions per in the manufacturer or Department specifications.~~

END OF SECTION

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SECTION 13594

**FIBER OPTIC COMMUNICATION**

Delete Section 13594 and replace with the following:

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Materials and procedures for~~Furnish~~, installing, and testing fiber optic  
communication systems.

**1.2      REFERENCES~~RELATED SECTIONS~~**

- A.      Section 13551: General ATMS Requirements
- B.      Section 13553: ATMS Conduit
- C.      Section 13554: Polymer Concrete Junction Box
- D.      Section 13555: ATMS Cabinet

**1.3      RERELATED SECTIONS~~REFERENCES~~**

- A.      Belleore Testing Requirements (No longer in 2.4 A. Barry)
- AB.      Electronic Industries Association (EIA) and Telecommunications Industry  
Association (TIA) Specifications
- BE.      National Electrical Code (NEC)
- CD.      Telcordia Guidance
- DE.      Underwriters Laboratory (UL)
- EF.      USDA Rural Electrification Administration (REA) Specifications

## 1.4 DEFINITIONS

- A. OTDR: Optical Time Domain Reflectometer
- B. OSP: Outside Plant

## 1.5 SUBMITTALS

- A. Provide all submittals in accordance with Section 13551.
- B. Provide Evidence of training and experience for all fiber optic staff, including but not limited to installation technician, splice technicians and test technicians. Include in the file for each technician a resume listing relevant education and experience, and a certificate of completion for the fiber optic training course.
- C. For approval:
  - 1. A detailed construction and installation procedure covering all aspects for the fiber optic cable installation on this project.
  - 2. All materials for the fiber optic cable installation on this project.
  - 3. Fiber labeling setup.
- ~~D. Prior to Before the splicing of any fiber cable, submit to the Engineer the part number and manufacturer of the cleave tool along with an "end angle" distribution chart which demonstrates the actual 150-cut end angles.~~
- ~~ED. Submit to the Department and maintain on file a current calibration certificate for the OTDR being used.~~
- ~~F. Submit OTDR test results to the Department in a neatly bound and printed format for acceptance. Include the current calibration certificate for the OTDR being used at the front of the documentation.~~ Electronic submittal to Engineer on floppy disk or CD is also required. All Electronic files will be compatible with Siecior OTDR 383PCW Version 1.21 or higher.
- ~~GFE.~~ Submit Power Meter/Light Source Test results to the Department for acceptance. Use the test form obtained during the preconstruction meeting or Obtain the test form from the Department Fiber Representative.

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. All materials are UL listed.
- B. Provide all incidental materials including but not limited to fiber optic jumpers, cable ties, labels, data cables, and connectors.
- C. All materials meet Fluid Penetration Test standards (TIA/EIA-455-82B).

### 2.2 FIBER OPTIC CABLE

- A. ~~Contact the Engineer for approval of fiber that is to be used.~~ Fiber must be approved by the USDA Rural Electrification Administration (PE-90).
- B. The fiber optic cable is an Outside Plant (OSP) type, non-armored dielectric loose tube, single-mode cable.
- C. Include the manufacturer's test documentation-. This documentation indicates the attenuation of each cable fiber in dB/km, measured at 1310 nm and 1550 nm for single-mode.
- D. Outside Plant (OSP) Single-mode.
  - 1. Fiber Optic Glass: Corning SMF-28E or approved equal.
  - 2. Fiber Optic Cable: Corning ALTOS or approved equal.
- E. Fiber optic cable must comply with Telcordia GR20-CORE and TIA/EIA-4720000-A.
- F. Outer jacket labeling:
  - 1. The date of manufacture and the manufacturer's name.
  - 2. A numerical sequence, at intervals no greater than 10 ft, to determine the length of cable and amount of cable remaining on the reel.
  - 3. ~~"Utah Department of Transportation"~~UDOT Fiber Optic Cable" at an interval of no greater than 10 ft.
  - 4. Height of the markings is  $\frac{1}{8}$  inch nominal.

## 2.3 FIBER OPTIC CONNECTORS

- A. With the following characteristics and as specified ~~on the plans~~ in the contract:
  - 1. LC – Connectors (Standard)
    - a. Factory installed prepolished or field installed camlock LC ~~or LC compatible~~ connectors.
    - b. Ceramic ferrules.
    - c. Maximum insertion loss: 0.30 dB.
    - d. Connector back reflection: greater than 35 dB.
  - 2. ST – Connectors (to be used only where approved)
    - a. Factory installed or field installed ST or ST compatible connectors.
    - b. Ceramic ferrules and metallic connector bodies.
    - c. Maximum insertion loss: 0.30 dB.
    - d. Connector back reflection: greater than 35 dB.
- B. Clean all connectors with alcohol wipes and a compressed cleaning gas.
- C. Furnish and install new fan-out kits to replace any existing fan-out kits that must be severed ~~in order~~ to make fiber terminations.

~~D. —Field polishing of connectors is not allowed.:~~ Not acceptable.

## 2.4 TYPE A AND B FIBER OPTIC CABLE SPLICE ENCLOSURE

(NOTE: This article is changed but does not reflect that fact. Barry)

- A. Provide splice enclosures with the following minimum characteristics:
  - 1. Comply with Telcordia GR-771
  - 2. Corrosion resistant shell
  - 3. Allow re-entry without replacing the cable seals
  - 4. One 3-section end plate with 6 pre-molded cable entry ports
  - 5. One blank end plate
  - 6. Hinged splice trays to provide easy access to splices on other trays
  - 7. Strength member tie-off
  - 8. Mechanism to resist cable pull-out
  - 9. All required accessories to complete the splice
- B. Type A:
  - 1. Accommodates up to 288 splices
  - 2. Contains 2 or more 36-count splice trays
- C. Type B: For locations with up to 48 splices.
  - 1. Accommodates up to 48 splices
  - 2. Contains 2 or more 12-count splice trays

## 2.5 SPLICE ENCLOSURE FIBER DETAILS

- A. Provide 3 ~~feet~~ of buffer tube slack from ~~three-section~~ end plate.
- B. Provide label for each buffer tube located 1 inch from the splice tray. Description on label will identify as to which fiber cable and direction cable is coming from.
- C. Provide 3 to 4 ~~feet~~ of fiber optic strands, outside of buffer tube, from each cable before splicing.

## PART 3 EXECUTION

### 3.1 INSTALLERS

- A. Complete a three-day course on the installation, splicing, and testing of fiber optic cable.
  - 1. Course: conducted by the supplier of the fiber optic product or established education provider.
  - 2. In house and on the job training are not acceptable.
- B. Demonstrate two years total and one year continuous work experience with the splicing, termination, and testing of fiber optic cable.
- C. Perform all work with qualified staff.

### 3.2 FIBER OPTIC CABLE INSTALLATION REQUIREMENTS

- A. Do not perform fiber splices that are not shown in approved splice details without prior written authorization from UDOT ITS Fiber Division located at the UDOT Traffic Operation Center, 2060 S., 2760 W., Salt Lake City.
- B. Splice all drop cables to the main run of fiber with a mid span entry to the cable, unless ~~shown differently on project plans~~ described differently in the contract.
- CB. Notify the Engineer ~~threefive business days~~ 72 hours in advance of fiber optic cable installation into any existing conduit, ATMS site, or building facility.
- DC. The Engineer may initiate special inspection procedures to verify the condition of existing communications facilities. Observe inspections as desired.

- ~~ED.~~ Perform all work in facilities on conduits, junction boxes, cabinets, and buildings ~~for example~~ containing the Department's existing ~~communications~~ equipment only in the presence of ~~the~~ Department's representative.
1. Refer to Section 13553 for conduits
  2. Refer to Section 13554 for ~~conduits and~~ junction boxes.
  32. Refer to Section 13555 for cabinets.
- ~~FE.~~ Restore Contractor damaged facilities within 48 hours.
- ~~GF.~~ Lubricate cable with a lubricant designed for fiber optic cable installation.
- ~~HG.~~ Use shear pins or other failsafe means to prevent exceeding the maximum cable pulling tension specified by the cable manufacturer.
- ~~IH.~~ Maintain the following minimum bend radiuses:
1. 20 times Cable Diameter ~~Short Term D~~during ~~Installation~~installation.
  2. 10 times Cable Diameter ~~Long Term I~~nstalled.
- ~~J.~~ Maintain the following minimum slack requirements:
1. Splice Points: 35 ft. ~~from~~ installed splice case to conduit on all cables
  2. All Other Junction Boxes: 15 ft.
  3. Cabinets: 15 ft.
- ~~KJ.~~ Replace any fiber optic cable segment not meeting the requirements of the specifications in its entirety between ~~butt full~~ splice points shown ~~on the plan in~~ the contracts.
- ~~LK.~~ Place the locator wire in the dedicated 1 inch conduit (Refer to Section 13553) as ~~shown in the plan details~~described in the contract.

### 3.3 FIBER OPTIC CABLE PREPARATION

- A. Clean the fibers and buffer tubes using a solvent designed to remove all water blocking gel from each exposed fiber.
- B. Solvent requirements:
1. Must not remove any color from individual fibers (Refer to TIA/EIA-598-A) or buffer tubes.
  2. Not harmful to the polyethylene cable jacket.

### 3.4 ENTRY AND REENTRY OF FIBER OPTIC SPLICE ~~ENCLOSURES~~

- A. Perform all work in a ~~suitable environment free from excess dust and moisture~~ environmentally controlled atmosphere. Acceptable environments to work on

splice enclosures include office type environments in buildings, splice trailers, and splicing tents with floors.

~~B. All~~ Do not perform fiber splicing, testing, ~~or~~ connecting, or opening of fiber ends must not occur in locations with freezing temperatures.

~~C. Do not expose open splice enclosures and fiber ends to,~~ rain, snow, or wind-blown dust.

### 3.5 FUSION SPlicing

A. For all fiber splicing, use~~All fiber splicing;~~ fusion splice method.

B. Perform fusion splices as follows:

1. Use equipment with automatic fiber alignment and automatic light injection with detection devices or profile alignment algorithms to estimate splice losses.
2. Provide splice ~~closure enclosure~~ as a protection for all splices and stripped cable.
3. House all splices in splice trays or organizers.
4. Use glass capillaries, heat shrink tubing, or silicone sealant to provide additional protection and strain relief.
5. Comply with maximum splice loss allowance of 0.05 dB.

C. Install new splice enclosure end plates per manufacturer's recommendations at each location where there is a new fusion splice in an existing splice enclosure ~~per manufacturer's recommendations~~.

### 3.6 CABLE LABELING REQUIREMENTS

A. Label all fiber optic cables in every accessible location with a high quality permanent label, indicating the street name or location and type of circuit (e.g., drop cable, distribution, backbone-96 count).

B. Use Panduit MP-150-C or equivalent.

### 3.7 ACCEPTANCE TESTING

A. Contact the Engineer ~~72 hours~~ threefive business days ~~prior to~~ before performing all acceptance testing (Post Termination and Splicing OTDR and Power Meter).

B. Perform all fiber optic testing with an OTDR capable of producing output files compatible with the Siecor OTDR 383PCW Version 1.21 or higher.



- C. Repair any damaged fiber strands using fusion splicing methods and repeat all tests described below.
- D. OTDR Testing Requirements:
1. After completing the required work, test every fiber strand passing through any open splice tray.
  2. Conduct all traces with a pigtail or fiber box between the OTDR and the fiber under test. Use pigtail of sufficient length as to show the connector, or the start of the strand under test.
  3. Do not exceed launch transition of 0.6 dB.
  4. Conduct all traces at both 1310 nm and 1550 nm.
  5. Unless otherwise noted, uni-directional traces are acceptable.
  6. Provide traces with the following information:
    - a. Horizontal Axis: Distance in Feet and Kilometers.
    - b. Vertical Axis: Attenuation scale in dB.
    - c. Traces showing attenuation versus distance.
    - d. Cursors positioned at cable ends.
  7. Tabulate for each trace: method, fiber type, wavelength, pulse width, ~~refraction~~-refractive index, range, search threshold, reflection threshold, end threshold, warning threshold, backscatter, jumper length, file date, file time, fiber ID, cable ID, OTDR location, far end location, operator initials.
  8. Provide an event table showing all events having more than 0.05 dB loss, containing event type, position from OTDR end, loss and reflectance.
  9. For cables less than 3300 ft (1 km) in length, the maximum total allowable attenuation is 1.0 dB.
  10. Identify fibers by strand number.
  11. Submit results in printed form on 8 1/2-~~inch~~ x 11-~~inch~~ paper in a suitable binder organized by cable and strand number.
  12. A cover sheet is required for each binder indicating which cable(s) were tested, the OTDR users name, the reviewers name, the type of test performed and the date(s) of the test.
  13. Cover sheets for final test results bearing the reviewers signature, the date, and a statement indicating that the installation complies with the requirements of this section is required.
  14. The Contractor's employee who has reviewed the traces is required to sign or initial them. A check mark is required on all traces that satisfy the requirements identified herein. For intermediate test results, flag any discrepancies that may exist with a short description of the proposed corrective action: (e.g. resplice).
  15. Submit to the Engineer on 3-1/2-~~inch~~ floppy disk or CD electronic media with a printed index.

E. ~~Receiving Test:~~

~~1. Fibers Tested: Normally all strands, one strand per buffer tube. Test every strand when evidence of physical damage exists or when any damaged strand is found.~~

2. ~~Light Frequency: 1310 nm and 1550 nm.~~
3. ~~Direction: Uni-directional.~~
4. ~~Location of test: Contractor's yard.~~
5. ~~Test after receiving material, before releasing to installation crew.~~
6. ~~Tested by: Qualified Staff.~~
7. ~~Cable meets factory attenuation specifications.~~
  - a. ~~Cable attenuation 0.4 dB/km at 1310 nm.~~
  - b. ~~Cable attenuation 0.25 dB/km at 1550 nm.~~
  - c. ~~Strand lengths are consistent.~~
  - d. ~~Launch Transition < 0.6 dB.~~
  - e. ~~No event > 0.10 dB.~~
8. ~~Trace available for one strand in every buffer tube in the cable.~~
9. ~~Submit test reports to UDOT and receive acceptance from the Engineer prior to before installation.~~

**FE.** Post ~~Installation / Pre-Splicing Test:~~ **Blowing/Pulling—Pre Splicing Test:**

1. Fibers Tested: Normally, one strand per buffer tube. Test every strand when evidence of physical damage, excessive pulling tension, and kinks exist, or when any damaged strand is found.
2. Light Frequency: 1310 nm and 1550 nm.
3. Direction: Uni-directional.
4. Location of test: One field location for each cable installed.
5. Test after installing cable in duct but before splicing.
6. Tested by: Qualified Staff.
7. Witnessed/Approved by: Department inspector may witness and must approve before splicing.
8. Acceptance Criteria:
  - a. Cable attenuation 0.4 dB/km at 1310 nm.
  - b. Cable attenuation 0.25 dB/km at 1550 nm.
  - c. Strand lengths are consistent.
  - d. Launch Transition < 0.6 dB.
  - e. No event > 0.10 dB.
9. Trace available for one strand in every buffer tube in the cable.

**GF.** Post Termination and Splicing Test:

1. Test every strand in all cable segments including connectorized strands of drop cables.
2. Light Frequency: 1310 nm and 1550 nm.
3. Direction: Unidirectional.
4. Location of test: Every field location required to obtain access to each cable segment.
5. Test after terminating and splicing at all points ~~shown on the plans~~ **described in the contract.**
6. Cable Tested by: Certified Staff.

7. Department inspector witnesses and approves before final approval by the Engineer.
8. Acceptance Criteria:
  - a. Cable attenuation 0.4 dB/km at 1310 nm excluding splices ~~shown on the plans~~described in the contract or authorized by the Engineer.
  - b. Cable attenuation 0.25 dB/km at 1550 nm excluding splices ~~shown on the plans~~described in the contract or authorized by the Engineer.
  - c. Strand lengths are consistent.
  - d. Launch Transition < 0.6 dB.
  - e. No event > 0.30 dB.
  - f. Maximum splice attenuation 0.05 dB per splice unless otherwise ~~shown on the plans~~described in the contract.
9. Trace available for each strand in all cable segments.

**HG.** Power Meter/Light Test:

1. Connect the light source to the connectorized fiber at the location identified on the Fiber Optic Light Source Power Meter Test Form provided by the Resident Engineer or Department Fiber Representative at the pre-construction meeting. Connect a power meter to the other end of the fiber at the location identified on the Test Form. Record the results and submit the completed form to the Engineer.
2. Use the light frequencies of 1310 nm and 1550 nm, or as indicated in test forms.
3. Perform the test bi-directional.
4. Test every field location required to obtain access to each cable segment.
5. Perform all testing using a qualified staff member.
6. A Department inspector witnesses and approves the results before final approval by the Engineer.
7. Acceptance Criteria:
  - a. Cable attenuation as called for in test plans.
  - b. Test is available for each strand indicated in test plans. Otherwise, test will be available for each strand in each cable segment.

**IH.** All work to conform to the National Electrical Code.

END OF SECTION

**Supplemental Specification**  
**2005 Standard Specification Book**

**SECTION 13595**

**ATMS INTEGRATION**

**Delete Section 13595 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Integration of all appropriate ATMS devices, including successful completion and documentation of all field operational tests.
- B.      Install and connect all incidental equipment as required for a complete and operational system.
- C.      Furnish all necessary test materials, cables, connectors to complete and test the integration of the ATMS device.

**1.2      RELATED SECTIONS**

- A.      Section 13551: General ATMS Requirements

**1.3      SUBMITTALS**

- A.      In accordance with Section 13551.
- B.      Test report for the ~~Thirty~~ 30 Day ATMS Burn-In Test.

**PART 2      PRODUCTS      Not used**

## PART 3 EXECUTION

### 3.1 ACCEPTANCE TESTING

- A. Provide a Completion Notice per Section 13551 once Local Field Operations Tests have been successfully completed on all devices. Notify the Engineer in writing of readiness to begin ~~the Integration Task. 30 Day ATMS Burn-In Test~~integration.
- B. Integration requires the successful completion of a ~~Thirty~~ 30 Day ATMS Burn-In Test, consisting of the verification of valid data and control at the communications demarcation point for all devices, ~~is required for Final Acceptance.~~ Obtain UDOT's newest version of the 30 Day ATMS Burn-in Test Report form from the UDOT Web site. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>. ~~Refer to~~ <http://www.dot.utah.gov/index.php?m=c&tid=332> ~~http://www.udot.utah.gov/index.php/m=c/tid=719.~~
- ~~C. —Furnish all necessary test materials and cables and connectors to complete and test the integration of the ATMS device.~~
- ~~D.C.~~ Notify the Engineer in writing at least five working days ~~in advance of~~ before the proposed date ~~upon which that~~ the Acceptance Tests will take place. Obtain UDOT's newest version of the ~~5-Day~~ ATMS Testing Pre-Notification form from the UDOT Web site. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>. ~~Refer to~~ <http://www.dot.utah.gov/index.php?m=c&tid=332> ~~http://www.udot.utah.gov/index.php/m=c/tid=719.~~ The Engineer ~~will~~ must witness the Acceptance Tests or designate ~~es~~ an individual or entity to witness the Acceptance Test on the Department's behalf.
- ~~DE.~~ Once the Local Field Operations Test has been successfully completed on all sites, the Engineer may grant Partial Acceptance of the project. The ~~Thirty~~ 30 Day ATMS Burn-In period begins at this time. Begin the ~~Thirty~~ 30 Day ATMS Burn-In period for all ATMS devices of the same type on the same day.
- ~~EF.~~ Operate the device, in coordination with ~~Department~~ Traffic Operations Center (TOC) staff, on a daily basis during the ~~Thirty~~ 30 Day ATMS Burn-In period noting the results on the 30-Day ATMS Burn-in ~~ATMS~~ test form.
- ~~1. —Accomplished by Department staff along with the contractor.~~

~~2.~~ The ~~Traffic Operations Center~~Department (TOC) staff may ~~also~~ help verify the daily equipment operation if at the time of testing, communications are consistently provided from the site to the TOC.

- ~~FG.~~ Promptly remedy the defect in the event of a failure due to ~~of Contractor furnished~~ equipment or workmanship.
1. ~~-~~Provide the Engineer with a Completion Notice.
  2. Restart (from day one) the ~~Thirty~~30 Day Burn-In period ~~re-starts~~ for that device.
  3. The Engineer may identify an independent third party to specify what defects (if any) must be addressed ~~in order~~ for the work to meet the specifications in the event of a second failure at the same device. If defects are identified,
    - a. ~~At the Contractor's expense~~the Contractor is required to cover expenses if defects are identified, otherwise the Department covers the third party's costs~~cover the costs required to remedy the defect.~~
  4. The Engineer may authorize others to complete the work at ~~the Contractor's expense~~no additional cost to the Department if the Contractor fails to remedy any identified deficiencies in the work within the time required by the Engineer.

~~H.~~ ~~Troubleshoot all problems on State furnished items.~~

- ~~1.~~ ~~Suspend the thirty day test while the problem is corrected on state furnished item.~~
- ~~2.~~ ~~Resume testing follow resolution.~~

| G. Engineer grants Final Acceptance after the ~~Thirty~~30 Day Burn-In period is complete and all required documentation has been received.

END OF SECTION







L

LETTER POSITIONS (X)

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B

<p align="center"><b>UTAH DEPARTMENT OF TRANSPORTATION</b></p> <p align="center">STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION</p> <p align="center">SALT LAKE CITY, UTAH</p>	
<p align="center"><b>RECOMMENDED FOR APPROVAL</b></p>	
<p>CHAIRMAN STANDARDS COMMITTEE</p>	<p>APR. 29, 2004</p>
<p>DATE</p>	<p>DATE</p>
<p>APR. 29, 2004</p>	<p>DATE</p>
<p>LEGACY DIRECTOR</p>	<p>DATE</p>

1

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STANDARD DRAWING TITLE

STANDARD DRAWING TITLE

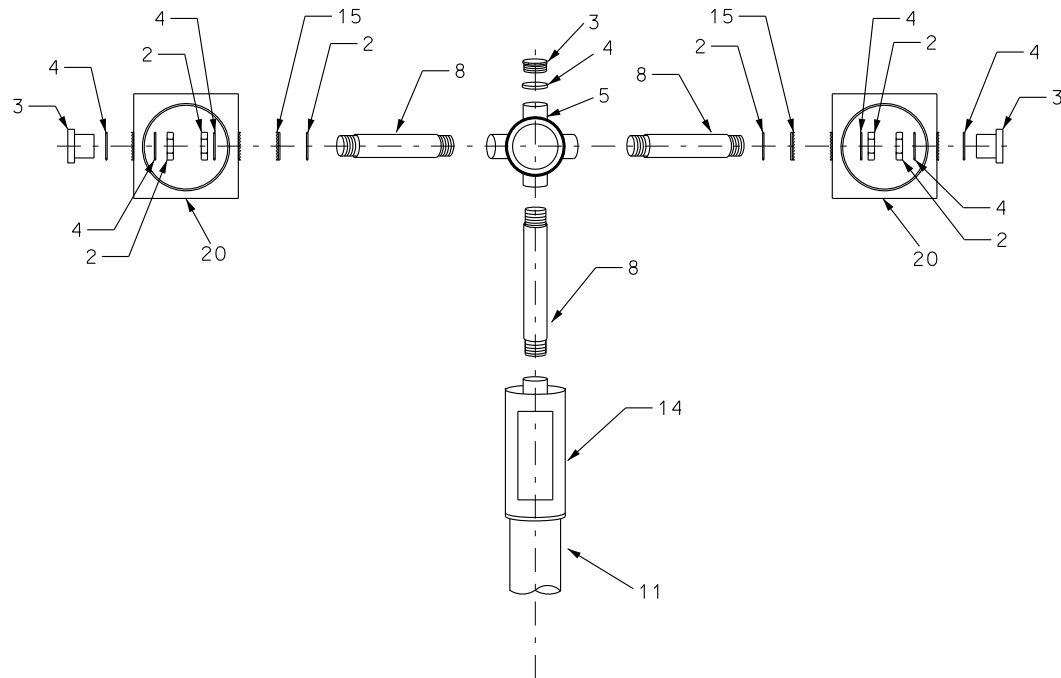
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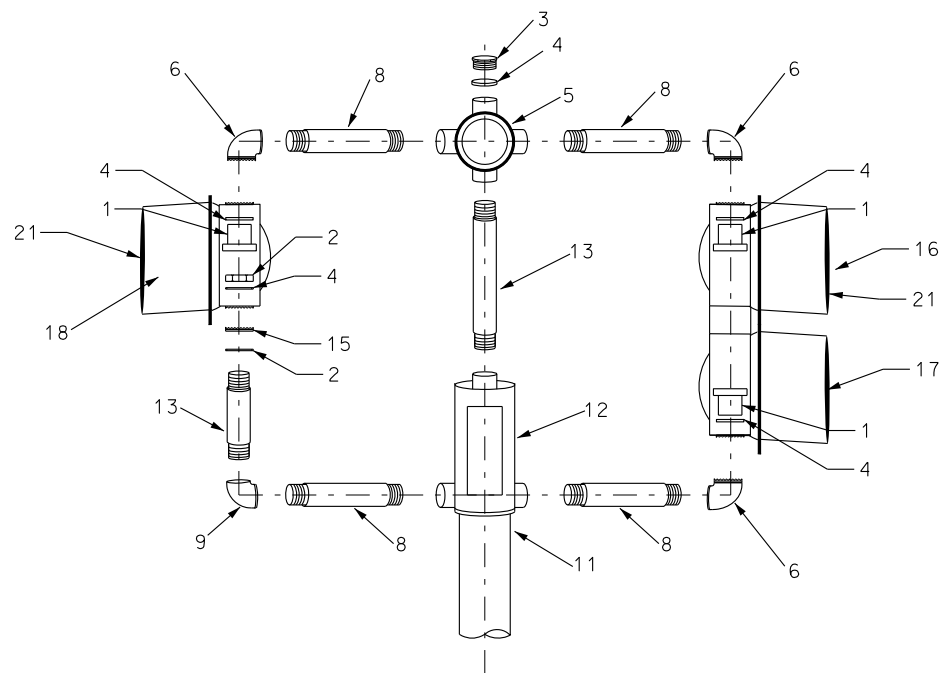
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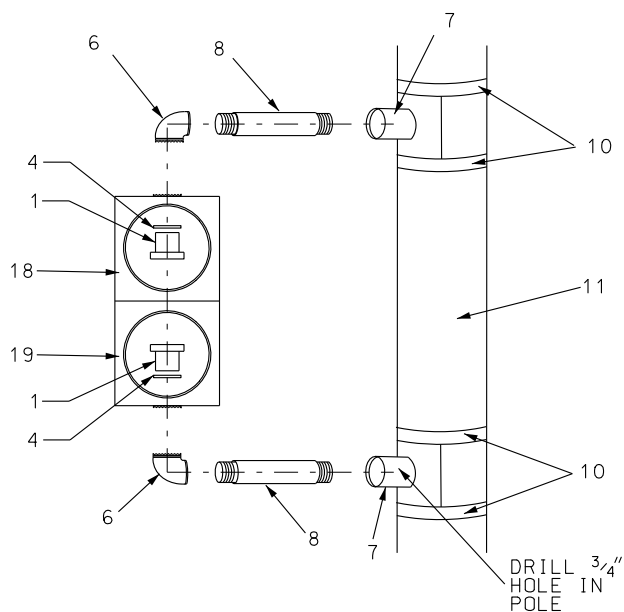




**A**  
**AT 4** ADVANCE FLASHING BEACON  
SIGNAL HEAD MOUNTING DETAILS



**B**  
**AT 4** TOP SIGNAL HEAD MOUNTING DETAILS  
WITH ENFORCEMENT INDICATION



**C**  
**AT 4** SIDE SIGNAL HEAD MOUNTING DETAILS  
(SEE NOTE 1)

#### DETAIL LEGEND

- |   |  |
|---|--|
| 1. LOCK NIPPLE, BRASS, $1\frac{1}{2}'' \times 1\frac{3}{4}''$               | 15. WASHER, SERRATED, $1\frac{1}{2}''$ |
| 2. LOCK NUT, BRASS, $1\frac{1}{2}''$  | 16. SIGNAL HEAD - RED LED, 12"         |
| 3. CAP, ORNAMENTAL, LONG, BRASS, $1\frac{1}{2}'' \times 1\frac{3}{4}''$     | 17. SIGNAL HEAD - GREEN LED, 12"       |
| 4. WASHER, STAINLESS STEEL  | 18. SIGNAL HEAD - RED LED, 8"          |
| 5. HUB, CENTER W/COVER PLATE 4-WAY, BRASS                                   | 19. SIGNAL HEAD - GREEN LED, 8"        |
| 6. ELBOW, 90°, GALVANIZED, THREADED INSIDE, $1\frac{1}{2}''$ SERRATED       | 20. SIGNAL HEAD - AMBER LED, 8"        |
| 7. ROUND POLE PLATE, GALVANIZED   | 21. VISOR - 8" AND 12"                 |
| 8. PIPE, GALVANIZED, THREADED BOTH ENDS, $1\frac{1}{2}'' \times 12''$       |  |
| 9. ELBOW, 90°, GALVANIZED, THREADED INSIDE, $1\frac{1}{2}''$                |  |
| 10. BANDS, STAINLESS STEEL, $\frac{3}{4}''$                                 |  |
| 11. POLE SHAFT  |  |
| 12. POST TOP TERMINAL COMPARTMENT, 2 WAY, BRASS, WITH NO TERMINAL BLOCK     |  |
| 13. PIPE, GALVANIZED, LENGTH VARIABLE, THREADED BOTH ENDS, $1\frac{1}{2}''$ |  |
| 14. POST TOP TERMINAL COMPARTMENT, BRASS, WITH NO TERMINAL BLOCK            |  |

#### NOTE:

1. USE SIDE SIGNAL HEAD ONLY ON SINGLE LANE RAMPS.

#### UTAH DEPARTMENT OF TRANSPORTATION

STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

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CHAIRMAN STANDARDS COMMITTEE

APPROVED

DEPUTY DIRECTOR

MARCH 15, 2004  
DATE

MARCH 15, 2004  
DATE

STANDARD DRAWING TITLE

TYPICAL RAMP  
METER SIGNAL  
HEAD MOUNTING

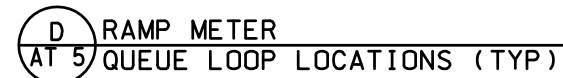
STD DWG

AT 4

#### REVISIONS

- |   |         |      |                                      |
|---|---------|------|--------------------------------------|
| 1 | 2/24/05 | S.S. | UPDATED AND REARRANGED DETAILS       |
| 2 | 6/21/06 | TJM  | ADDED VISOR AND DELETED POWDER NOTE. |

REMARKS



1. TAG EACH LOOP WIRE IN EACH JUNCTION BOX, BEGINNING WITH FIRST LOOP IN LANE CLOSEST TO SHOULDER.
2. PLACE JUNCTION BOXES PER AT 7. REFER TO SL 11 AND SL 12 FOR DETECTION.
3. USE THE CURRENT EDITION OF AASHTO ROADSIDE DESIGN GUIDE FOR CLEAR ZONE REQUIREMENTS. CLEAR ZONE MAY EXTEND INTO CUT OR FILL SLOPES.
4. USE PREFORMED LOOPS IN NEW PAVEMENT.
5. USE SEPARATE CONDUCTOR HOME RUN TO CABINET FOR EACH LOOP.
6. PLACE RAMP METER MAST ARM ASSEMBLY 1.2 TIMES THE AASHTO CLEAR ZONE DISTANCE AWAY FROM THE TRAVELED WAY, OR SHIELD AS PER THE CURRENT EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE.
7. PLACE CABINET ON EITHER SIDE OF TRAFFIC.

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<p align="center">DEPUTY DIRECTOR</p>	<p align="center">DATE</p>

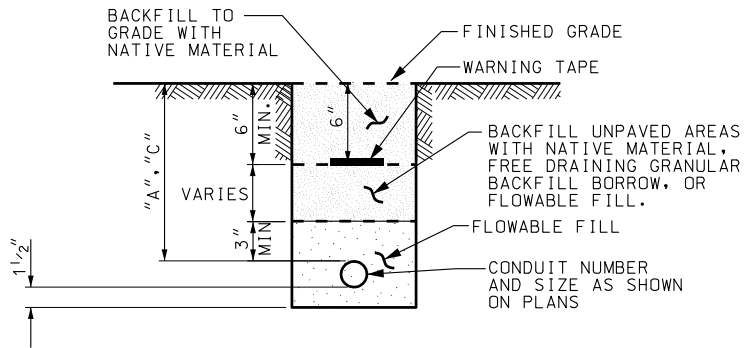
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## RAMP METER LOOP INSTALLATION

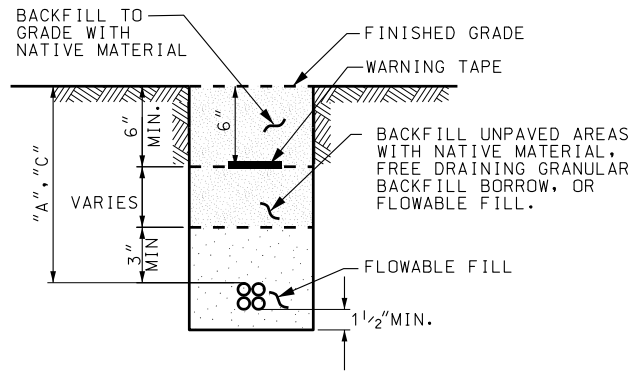
STD DWG  
AT 5

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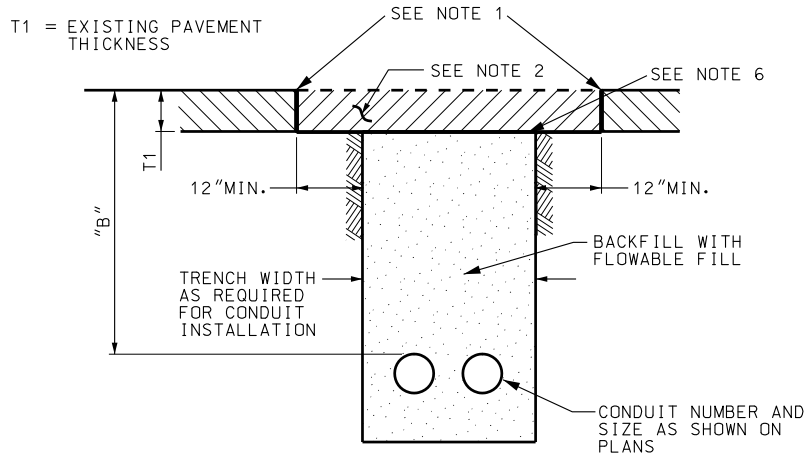
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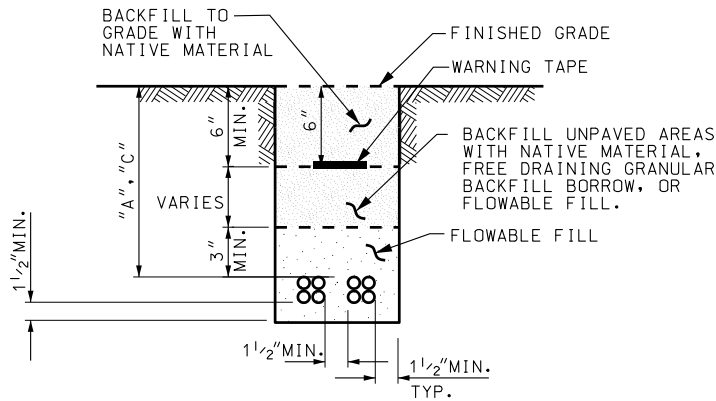
**D**  
**AT 6** NON-MULTIDUCT CONDUIT



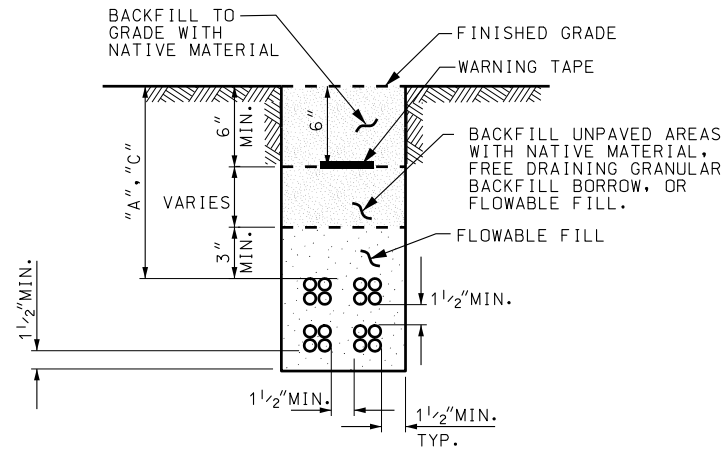
**A**  
**AT 6** 1-D MULTIDUCT CONDUIT



**E**  
**AT 6** CONDUIT TRENCHED IN ASPHALT PAVEMENT RESTORED WITH T PATCH



**B**  
**AT 6** 2-D MULTIDUCT CONDUIT



**C**  
**AT 6** 4-D MULTIDUCT CONDUIT

**TABLE 1. T PATCH RESTORATION**

EXISTING ASPHALT PAVEMENT THICKNESS (T1) IN INCHES	RESTORATION T PATCH THICKNESS IN INCHES
0 - 3 1/2	3 1/2
3 1/2 - 7	MATCH EXISTING DEPTH
7 OR GREATER	7

**TABLE 2. MINIMUM CONDUIT DEPTH**

	DEPTH IN INCHES	AREA
A	36	OUTSIDE 20 FT OF PAVEMENT EDGE
B	36	HIGHWAY RIGHT OF WAY UNDER ASPHALT PAVEMENT SURFACE
C	60	WITHIN 20 FT OF PAVEMENT EDGE

**NOTES:**

1. SAW CUT PAVEMENT EDGES. APPLY A HOT-POUR RUBBERIZED ASPHALT JOINT SEALANT OR APPROVED EQUAL, APPLIED AFTER PATCH IS INSTALLED.
2. USE HMA MATERIAL FOR T-PATCH. USE OPEN-GRADED SURFACE COURSE FOR PATCHES GREATER THAN 12 FEET WIDE, AND WHERE OPEN-GRADED SURFACE COURSE EXISTS.
3. ENCASE ALL OPEN TRENCH CONDUIT IN FLOWABLE FILL. ENCASE PLOWED AND BORED CONDUIT IN FLOWABLE FILL AT EXPOSED LOCATIONS, SPLICE POINTS, AND BOX CONNECTIONS.
4. INSTALL LOCATABLE PULL TAPE IN ALL EMPTY CONDUITS.
5. INSTALL #14 THWN LOCATOR WIRE WITH FIBER.
6. EVENLY APPLY TACK COAT ON FINAL BACKFILL BEFORE INSTALLING T-PATCH.

**UTAH DEPARTMENT OF TRANSPORTATION**

STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL

CHAIRMAN STANDARDS COMMITTEE  
APPROVED

DEPUTY DIRECTOR

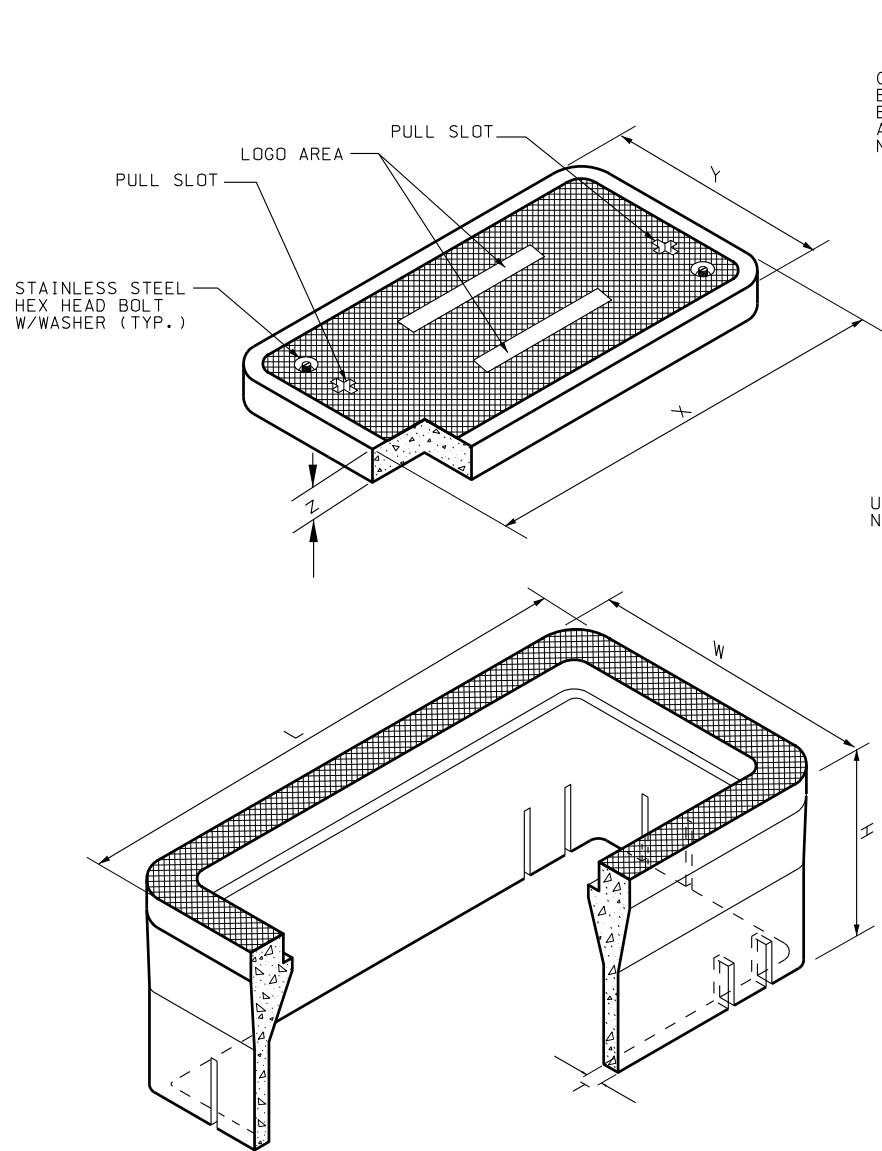
**CONDUIT DETAILS**

STD DWG  
**AT 6**

**REVISIONS**

NO.	DATE	APPR.	REMARKS
1	2/24/05	S.S.	REVISED MULTI-DUCT CONFIG AND T-PATCH REQUIREMENTS
2	2/22/07	T.M.	REMOVED LOCATE CONDUIT. REQUIRED LOCATE WIRE INSTALL WITH FIBER AND LOCATABLE PULL TAPE IN EMPTY CELLS. CLARIFIED FLOWABLE FILL REQUIREMENTS.

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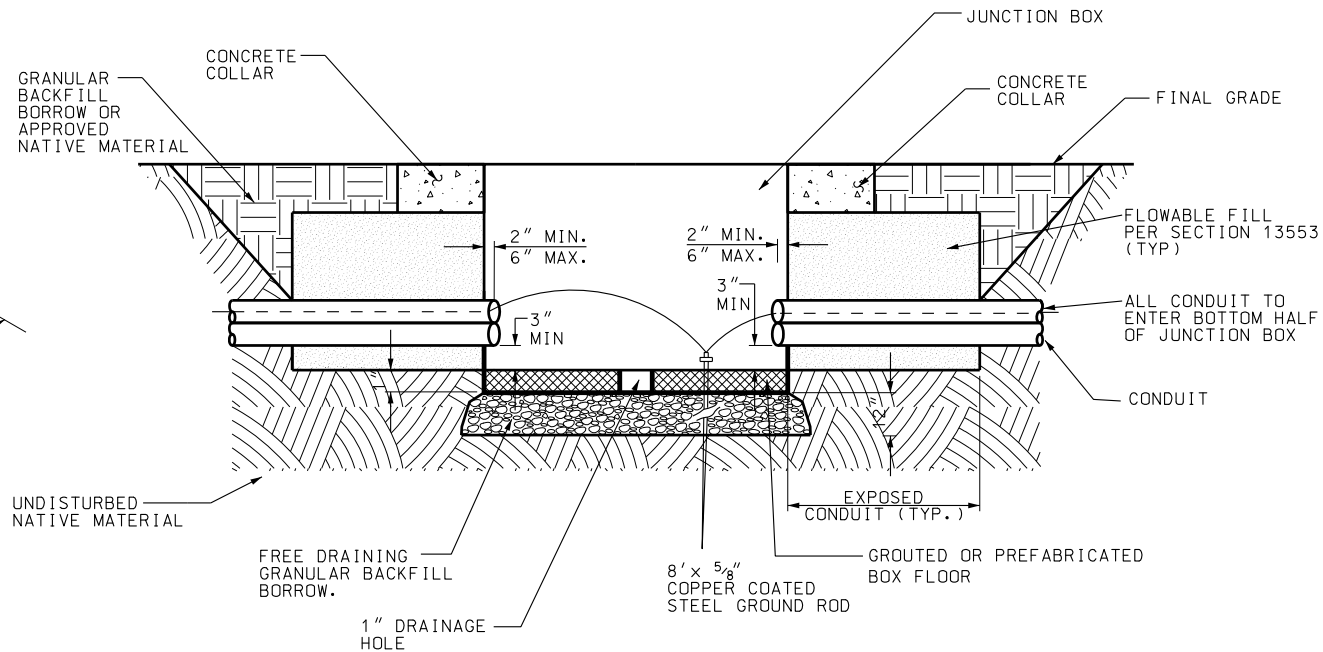


BOX AND LID DIMENSIONS

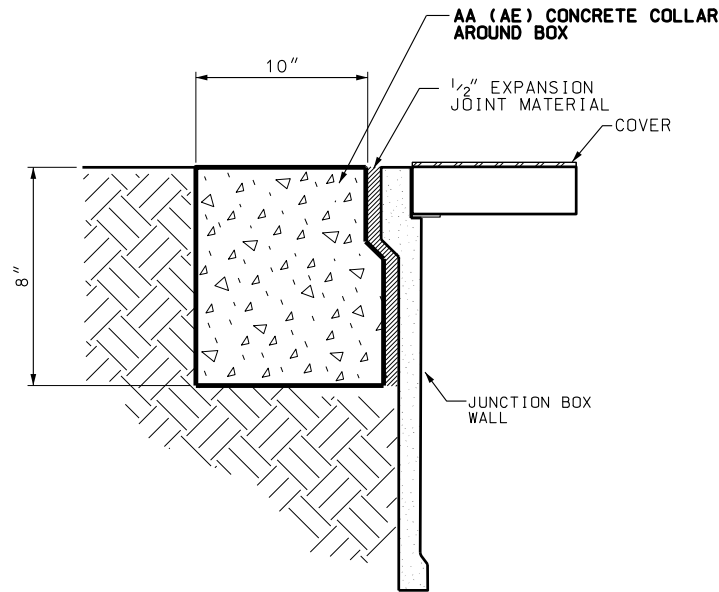
BOX TYPE	"L" inch	"W" inch	"H" inch	"T" inch	"X" inch	"Y" inch	"Z" inch
I-PC	25	16	24	1 1/2	23 1/4	13 3/4	2
II-PC	37 5/8	26	24	1 1/2	35 5/8	24	3
III-PC	49 5/8	32 1/8	24	2	47 5/8	30 1/8	3

NOTES:

1. STAMP BOX LOGO INTO THE LID FROM THE FACTORY. (SEE SECTION 13554).
2. DO NOT PLACE JUNCTION BOXES IN THE TRAVELED WAY OR ON FREEWAY SHOULDERS.
3. CONCRETE COLLAR WIDTH VARIES WHEN ADJACENT TO ATMS CABINETS. REFER TO AT AND SL SERIES STD DWGS.
4. PROVIDE CONCRETE COLLARS EXCEPT WITHIN CONCRETE PAVED AREAS.
5. INSTALL CONDUIT PLUG PER SECTION 13554.
6. ALIGN CONDUIT BY COLOR ON EACH SIDE OF THE JUNCTION BOX.



JUNCTION BOX CONDUIT PENETRATION DETAIL



JUNCTION BOX CONCRETE COLLAR DETAIL

TABLE 1. JUNCTION BOX LID STATIC VERTICAL LOAD RATING

MINIMUM DESIGN LOAD (lb)	MINIMUM TEST LOAD (lb)	TEST AREA (inch)
16,000	33,500	10 x 20

UTAH DEPARTMENT OF TRANSPORTATION

STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION

RECOMMENDED FOR APPROVAL

CHAIRMAN STANDARDS COMMITTEE

APPROVED

DEPUTY DIRECTOR

POLYMER-CONCRETE  
JUNCTION BOX  
DETAILS

STANDARD DRAWING TITLE

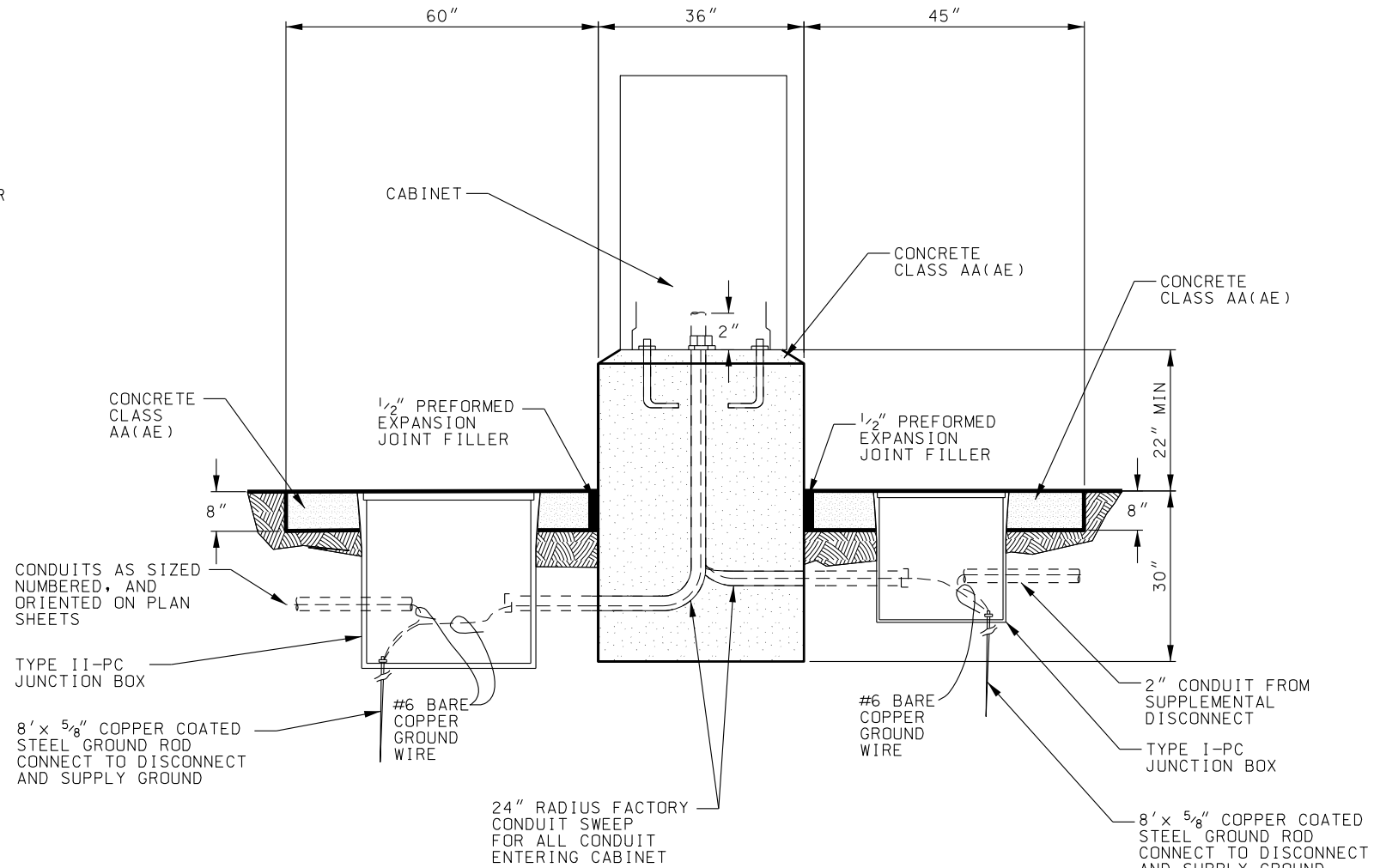
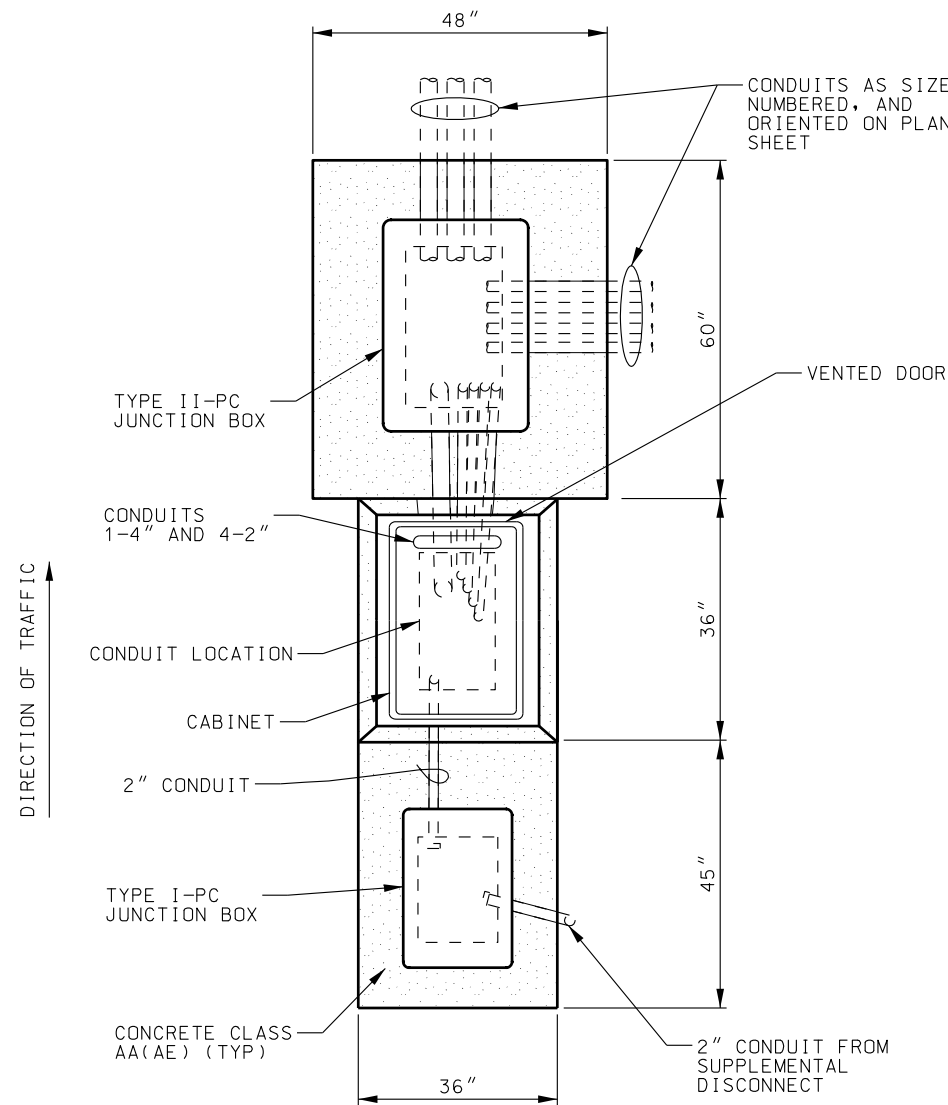
STD DWG

AT 7

REVISIONS

NO.	DATE	APPR.	REMARKS
1	12/24/05	S.S.	REMOVED LOAD 3 RATING BOXES AND REVISED DESIGN & TEST LOAD RATINGS.
2	02/23/06	L.M.	TABLE 1 AND TABLE 2 CHANGED TO ELIMINATE LOAD RATING 2. FREEWAY AND ARTERIAL APPLICATION DETAILS REMOVED.
3	02/22/07	T.M.	ADDED FLOW FILL LIMITS. REMOVED TERMINAL BLOCK AND LOAD RATING TABLE. CORRECTED BOLT CALLOUTS. MODIFIED NOTES.

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A  
AT 8

ATMS CABINET

NOTE:

1. SEE STD DWG AT 9 FOR CABINET DISCONNECT AND TRANSFORMER DETAIL.
2. FIELD VERIFY CONDUIT LAYOUT IN FOUNDATION TO AVOID CONFLICT WITH CABINET.
3. SEE STD DWG AT 7 FOR TYPICAL ATMS JUNCTION BOX INSTALLATION.

REVISIONS

NO.	DATE	APPR.	REMARKS
1	04/29/04	B.A.	SHADING FIXED IN DETAILS.

UTAH DEPARTMENT OF TRANSPORTATION

STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL

CHAIRMAN STANDARDS COMMITTEE  
APPROVED

DEPUTY DIRECTOR

APR. 29, 2004

DATE

APR. 29, 2004

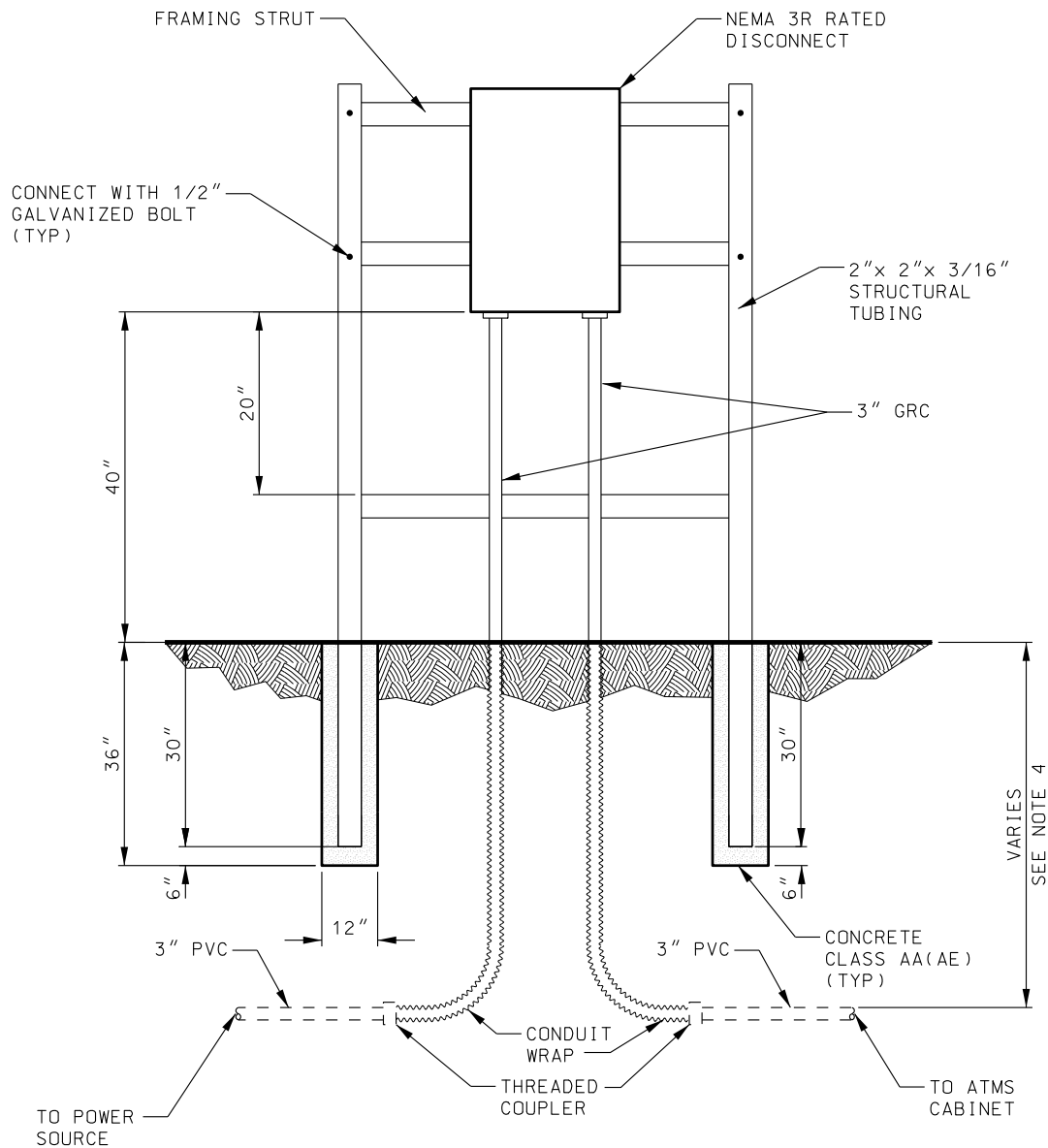
DATE

ATMS CABINET

STANDARD DRAWING TITLE

STD DWG  
AT 8

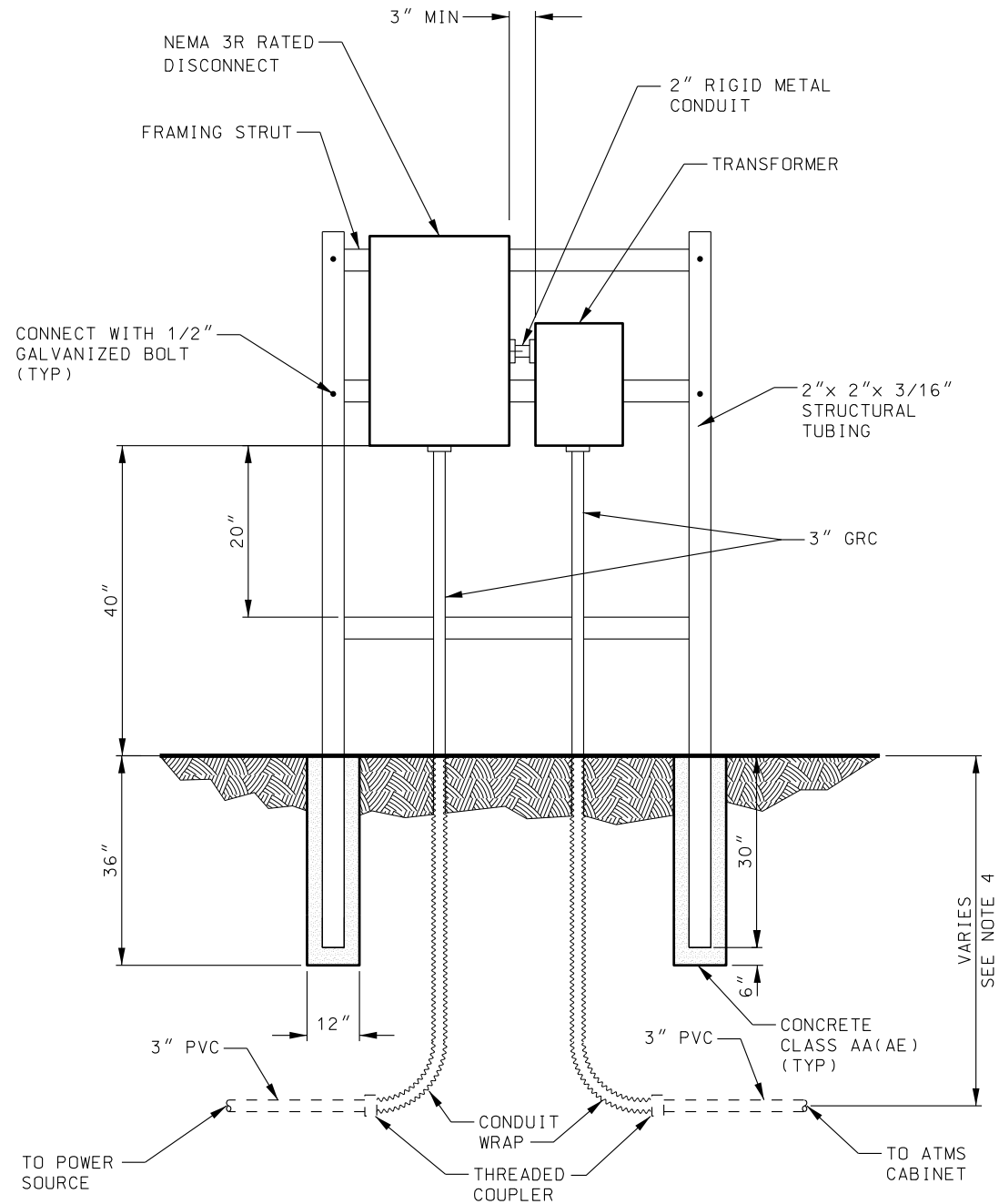
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**A**  
AT 9 SUPPLEMENTAL DISCONNECT FRAME

**NOTE:**

1. FRAME SHOULD BE LOCATED BETWEEN 10 TO 15 FEET FROM CABINET.
2. ROUND OFF SHARP EDGES OF STRUCTURAL TUBING.
3. ATTACH TRANSFORMER AND DISCONNECT TO FRAMING STRUT WITH WATERTIGHT GASKETS AND GALVANIZED HARDWARE.
4. FOR CONDUIT DEPTH REFER TO SECTION 13553.



**B**  
AT 9 SUPPLEMENTAL DISCONNECT WITH TRANSFORMER FRAME

REVISIONS  
1 12/24/05 S.S. NEW DRAWING

UTAH DEPARTMENT OF TRANSPORTATION  
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL  
CHAIRMAN STANDARDS COMMITTEE  
APPROVED  
DEPUTY DIRECTOR  
MARCH 15, 2004 DATE  
MARCH 15, 2004 DATE

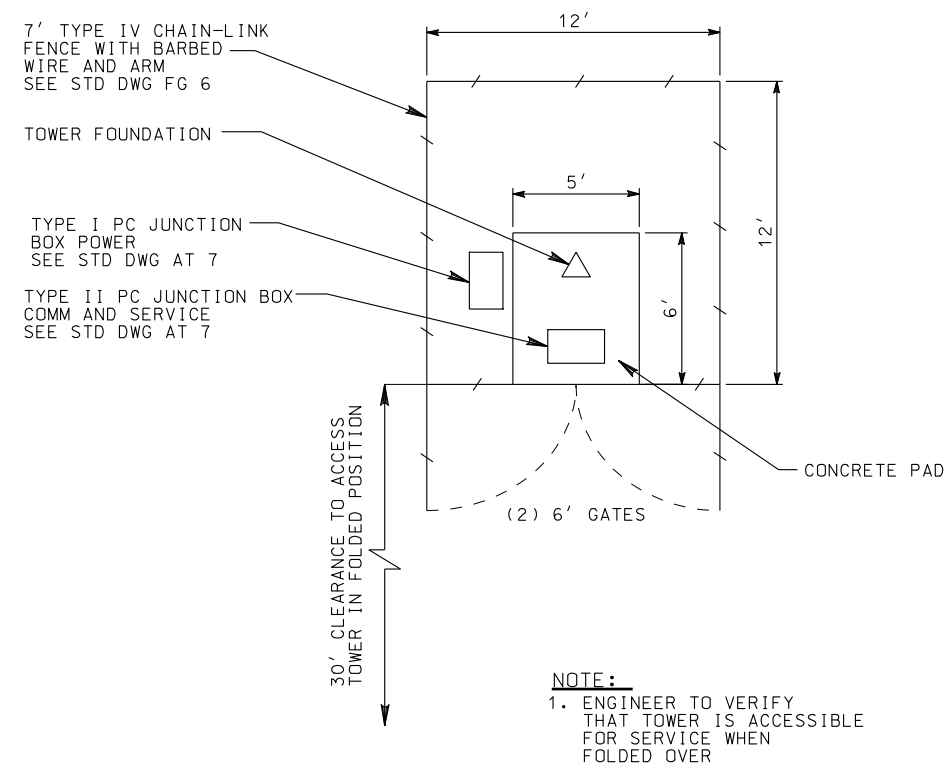
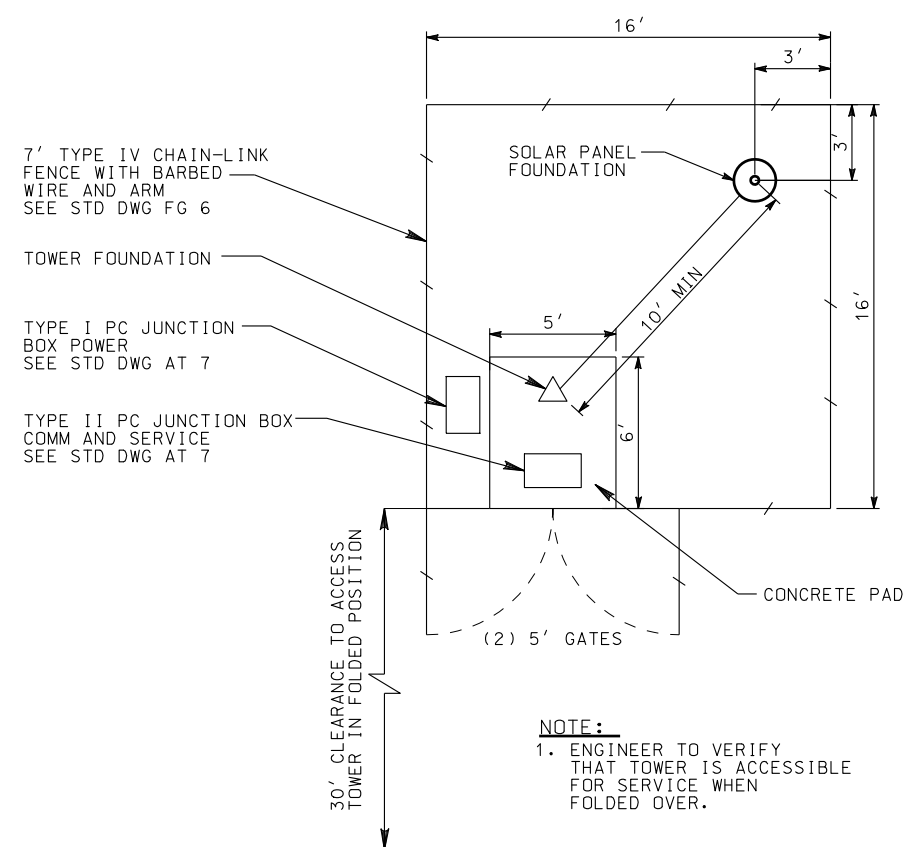
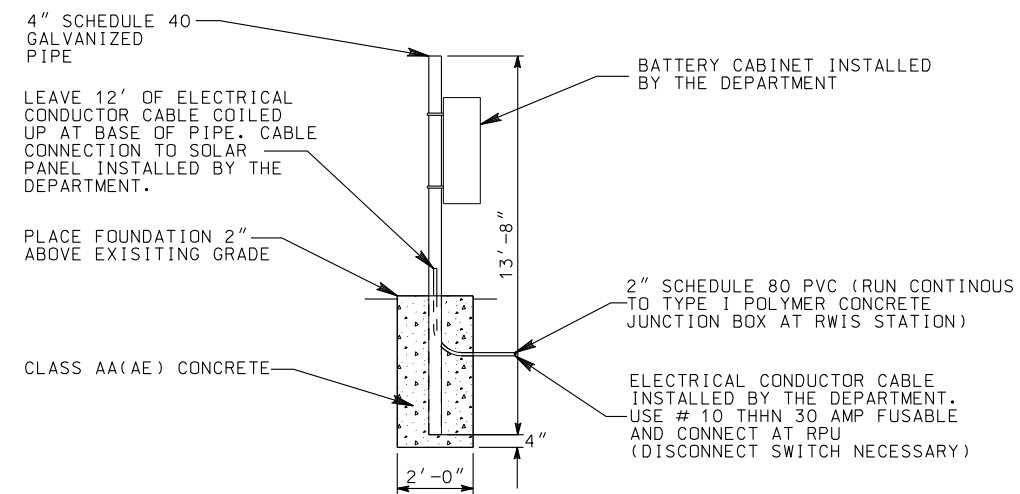
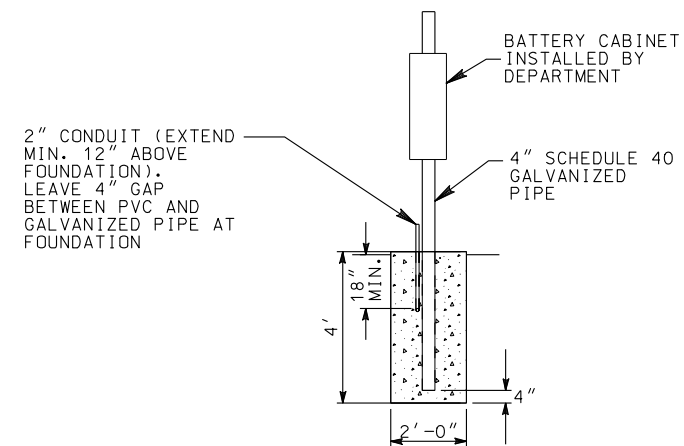
ATMS CABINET  
DISCONNECT AND  
TRANSFORMER FRAME

STD DWG  
AT 9

STANDARD DRAWING TITLE

REMARKS





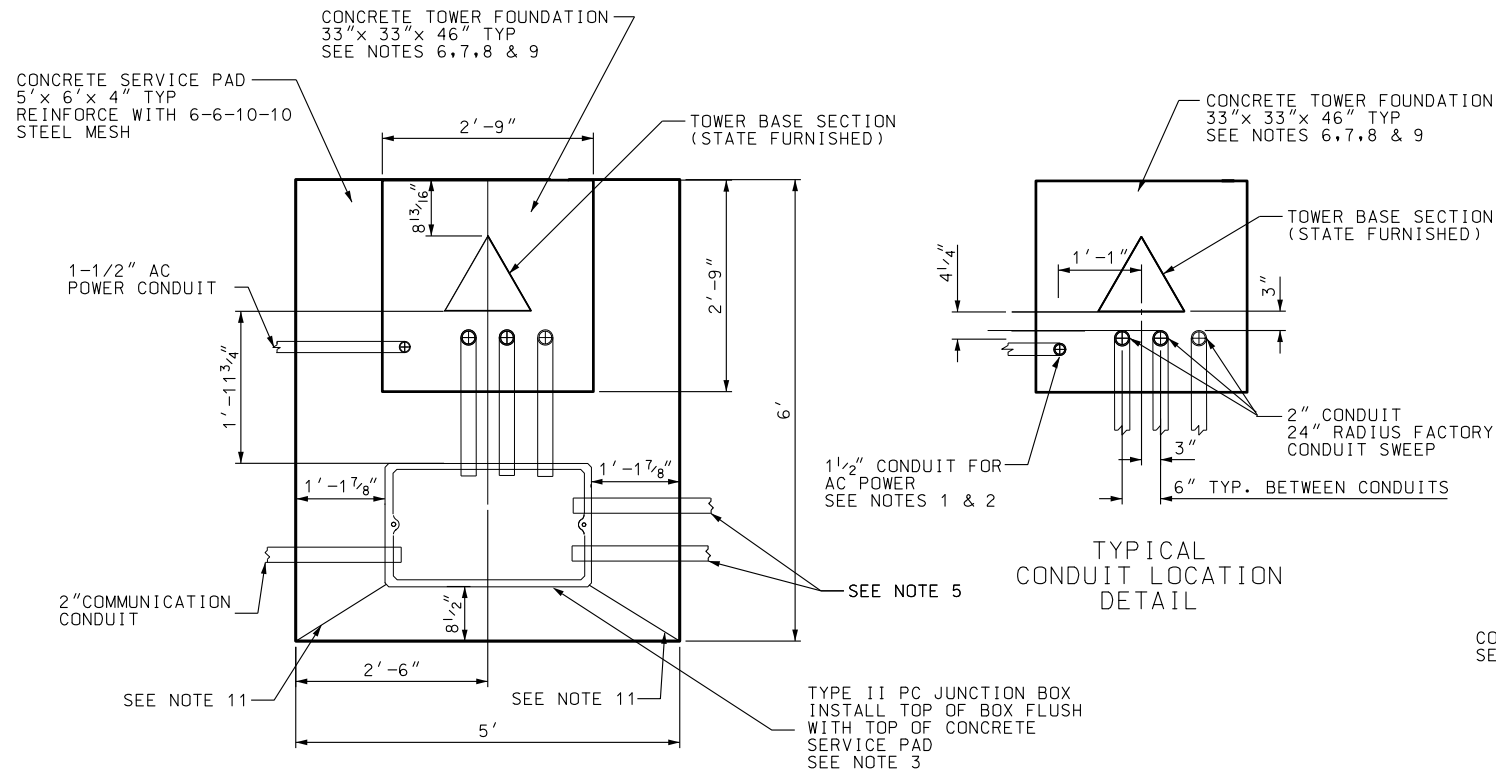
REVISIONS				
				PLAN DETAIL REMOVED DOUBLE CONDUITS, REVISED NOTE 4
1	03/22/04	G.K.		REVISED DETAIL TITLES
2	2/24/05	S.S.		INCREASED PIPE HEIGHT AND REVISED NOTES.
3	12/20/06	TJM		
NO.	DATE	APPR.		REMARKS

UTAH DEPARTMENT OF TRANSPORTATION  
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

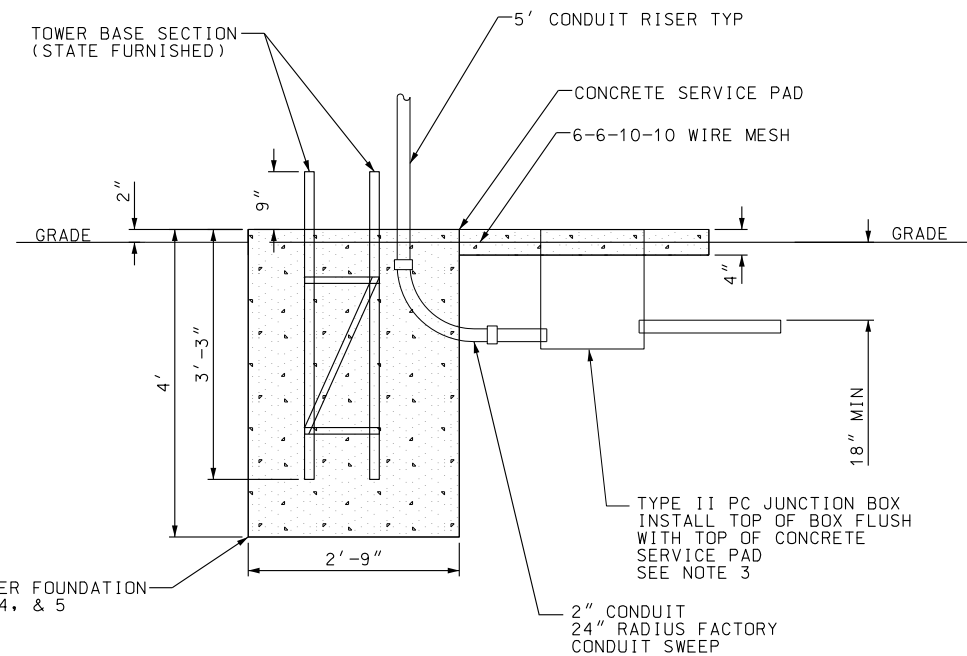
## RWIS SITE AND FOUNDATION DETAILS

STD DWG  
AT 15

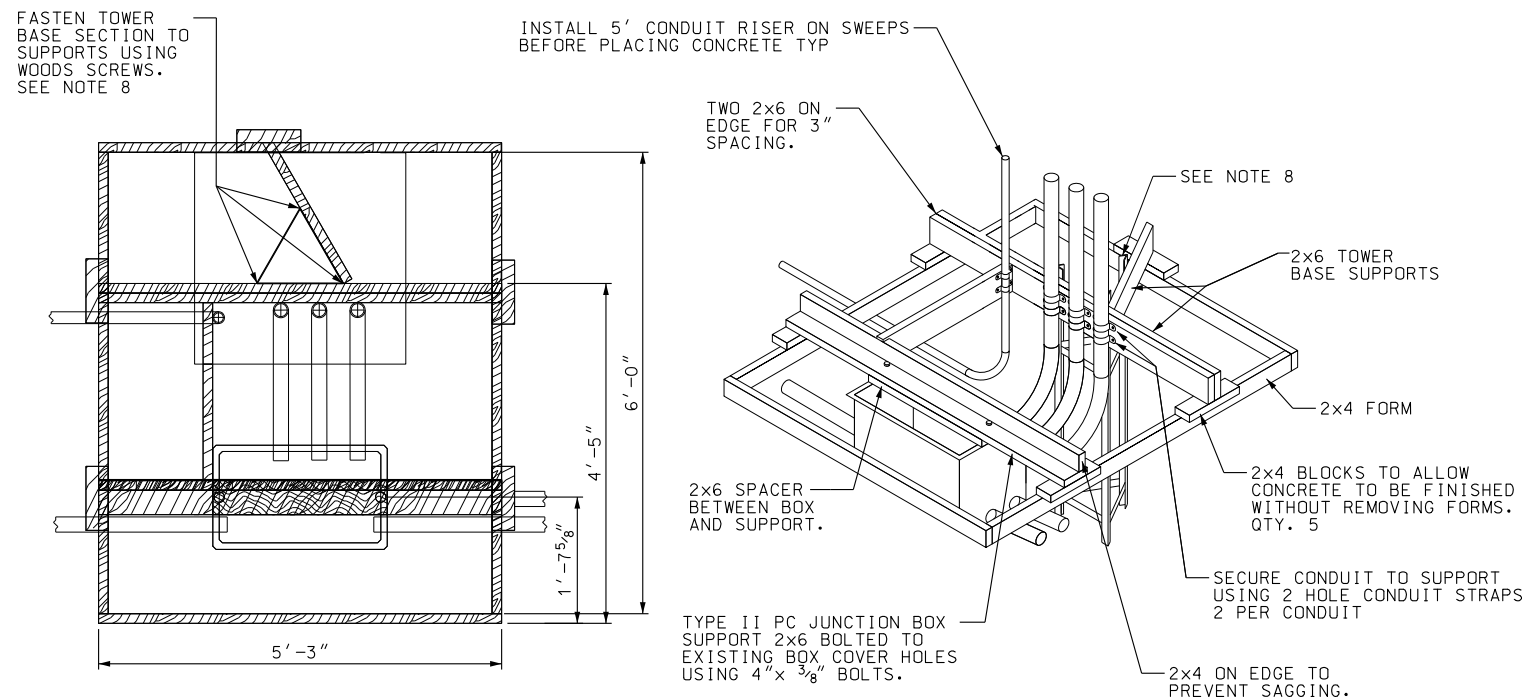
RECOMMENDED FOR APPROVAL	CHAIRMAN STANDARDS COMMITTEE APPROVED	APR. 29, 2004 DATE
	DEPUTY DIRECTOR	APR. 29, 2004 DATE



**A** RWIS TOWER BASE AND SERVICE  
AT 16 PAD INSTALLATION DETAIL



**B** RWIS TOWER BASE AND SERVICE  
AT 16 PAD INSTALLATION DETAIL  
LEFT SIDE VIEW



**C** RWIS TOWER BASE AND SERVICE  
AT 16 PAD CONCRETE FORM DETAIL

NOTES:

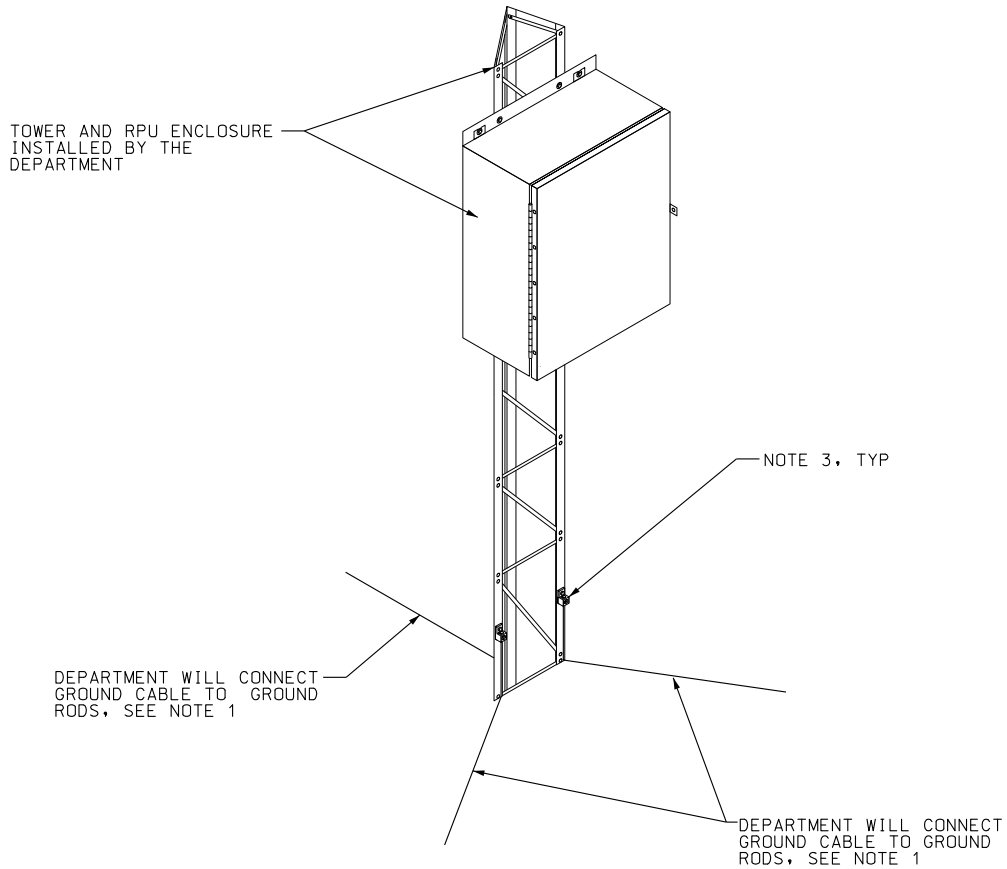
1. STUB OUT 1 1/2" POWER SERVICE INTO TYPE I POLYMER CONCRETE JUNCTION BOX.
2. CONDUIT LOCATIONS SHOWN ARE FOR A SQUARE D TYPE D SAFETY SWITCH, CATALOG # D221NRB.
3. INSTALL POLYMER CONCRETE JUNCTION BOXES AS PER STD DWG AT 7.
4. INSTALL ALL CONDUITS IN TOWER BASE CONCRETE TO PERMIT CONTINUATION TO RWIS ENCLOSURE.
5. STUB OUT 2" CONDUIT FROM POLYMER CONCRETE JUNCTION BOX TO BEYOND SERVICE PAD FOR SENSOR CABLES. ORIENT TOWARD NEXT JUNCTION BOX AS APPROPRIATE.
6. CONCRETE, MINIMUM CLASS AA(AE).
7. ALL SENSOR CABLES INSTALLED TO POLYMER CONCRETE JUNCTION BOX AND PULLED THROUGH 2" DIAMETER, 24" RADIUS, 90 DEGREE SWEEP FACTORY CONDUIT INTO RWIS ENCLOSURE.
8. LEVEL THE TOP OF THE TOWER BASE SECTION TO ASSURE A STRAIGHT AND PLUMB TOWER INSTALLATION. THE TOP OF THE TOWER BASE SECTION MUST BE 9" ABOVE THE CONCRETE SERVICE PAD.
9. FINISH CONCRETE TO DRAIN WATER.
10. THE FORM DETAIL SHOWN IS TYPICAL FOR A FLAT SURFACE INSTALLATION. MODIFY AS APPROPRIATE FOR FIELD CONDITIONS.
11. SCORE CONCRETE FROM THE CORNER OF THE BOX TO THE CORNER OF THE CONCRETE FOR AN EXPANSION JOINT.

REVISIONS				
NO.	DATE	APPR.	DATE	REMARKS
1	2/24/05	J.S.S.		REVISED NOTES AND DETAIL TITLES
2	12/20/06	TJM		REVISED NOTES AND DETAIL SPECS.

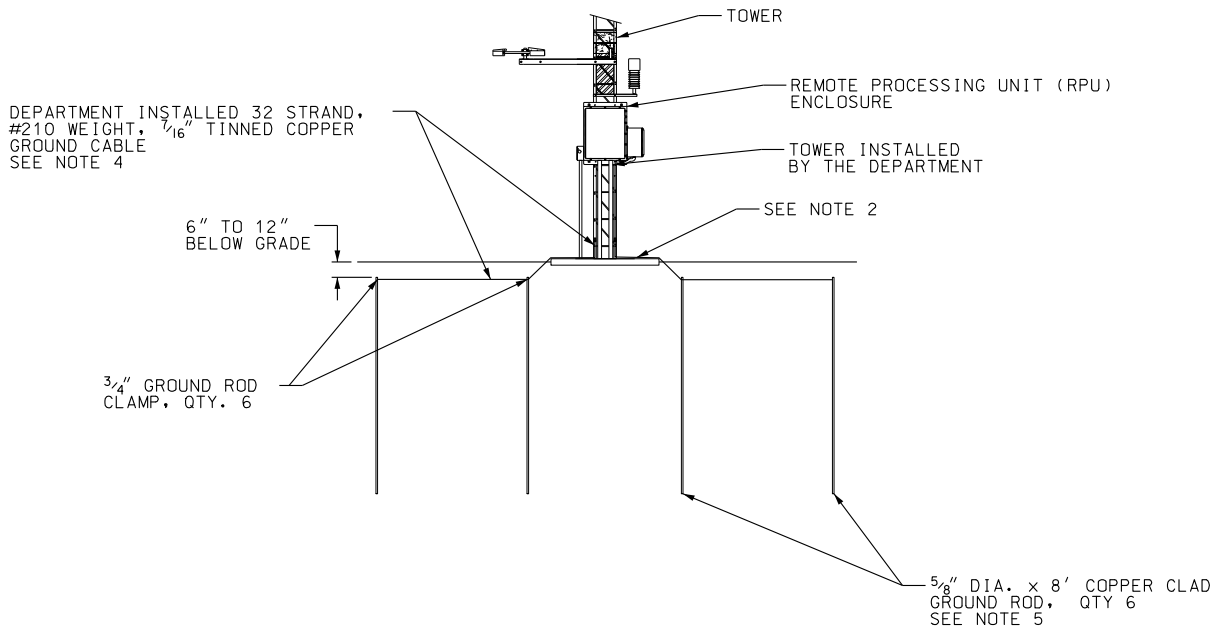
UTAH DEPARTMENT OF TRANSPORTATION		RECOMMENDED FOR APPROVAL	
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION		CHAIRMAN STANDARDS COMMITTEE	
SALT LAKE CITY, UTAH		APPROVED	
		DEPUTY DIRECTOR	
		DATE	
		MARCH 15, 2004	
		DATE	
		MARCH 15, 2004	

RWIS TOWER BASE AND SERVICE PAD LAYOUT		STANDARD DRAWING TITLE	
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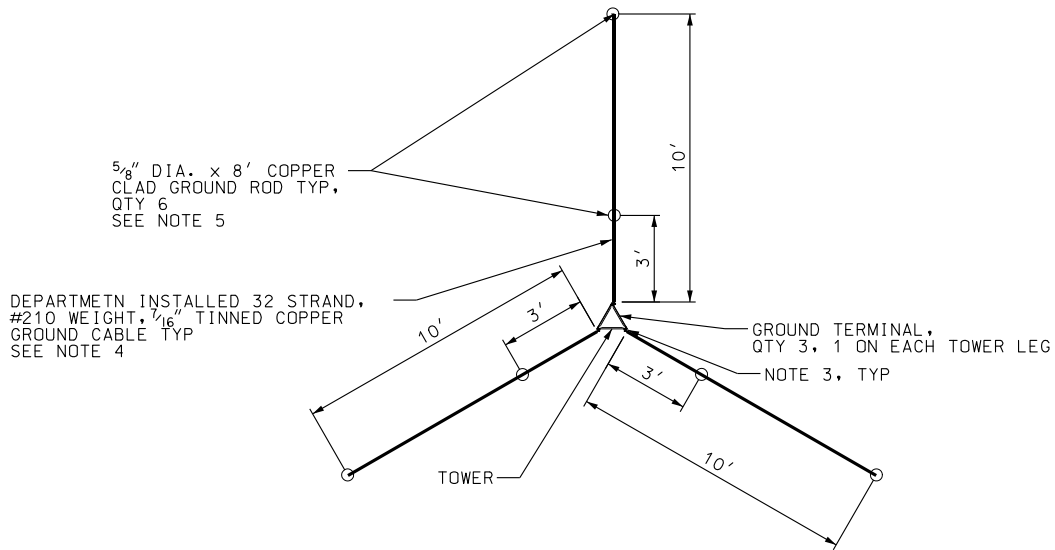
06-FEB-2007 DGN File: D:\Standards\SpecSection\Standards Committee\MeetingFiles\2007\February\22.07Mtg\Drawings\at17.dgn



**A** GROUND CABLE TERMINATION DETAIL  
AT 17



**B** GROUND CABLE TERMINATION DETAIL  
AT 17 PROFILE VIEW



**C** GROUND CABLE TERMINATION DETAIL  
AT 17 PLAN VIEW

**NOTES:**

1. DEPARTMENT WILL PLACE GROUND CABLES ON THE TOP OF CONCRETE PAD.
2. DEPARTMENT WILL ANCHOR GROUND CABLES FLAT AGAINST CONCRETE PAD WITH SUITABLE CLAMPS/ANCHORS. EXCESS WIRE TO BE ATTACHED TO TOWER BY THE DEPARTMENT.
3. INSTALL GROUND RODS FOR ALL 3 LEGS OF THE TOWER. DEPARTMENT WILL INSTALL GROUND WIRE.
4. DO NOT CUT WIRE, SHOULD BE CONTINUOUS TO EACH GROUND ROD.
5. STAKE OR FLAG THE LOCATIONS OF ALL GROUND RODS.

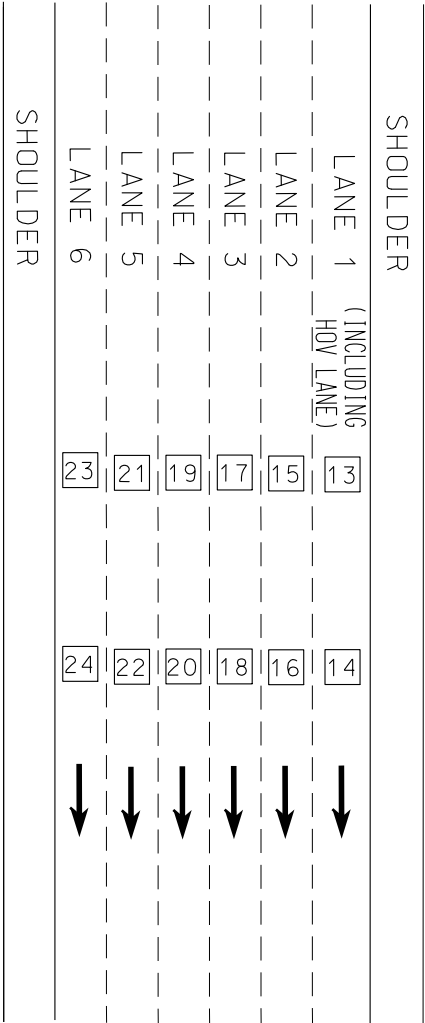
REVISIONS				UTAH DEPARTMENT OF TRANSPORTATION				GROUND ROD INSTALLATION AND TOWER GROUNDING			
NO.	DATE	APPR.	REMARKS	STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION				STD DWG			
1 2/24/05 S.S. REVISED NOTES				SALT LAKE CITY, UTAH				AT 17			
2 12/20/06 TJM CLARIFIED DEPARTMENT WORK				RECOMMENDED FOR APPROVAL				AND TOWER GROUNDING			
				CHAIRMAN STANDARDS COMMITTEE				STANDARD DRAWING TITLE			
				APPROVED							
				DEPUTY DIRECTOR							
				MARCH 15, 2004							
				DATE							
				MARCH 15, 2004							
				DATE							

- NOTES:
- 1.NUMBER ADDITIONAL DETECTORS INCREMENTALLY AFTER MAINLINE DETECTORS.
  - 2.PROVIDE DETECTION LAYOUT MAP IN EACH CABINET.
  - 3.REFER TO STD DWG SL 12 FOR LOOP DETECTION DETAILS.
  4. IF COMBINED WITH RAMP METERING, ONLY SAME DIRECTION OF TRAVEL MAY BE COMBINED. USE SEPARATE ATMS CABINET FOR OPPOSING MAINLINE TRAFFIC.

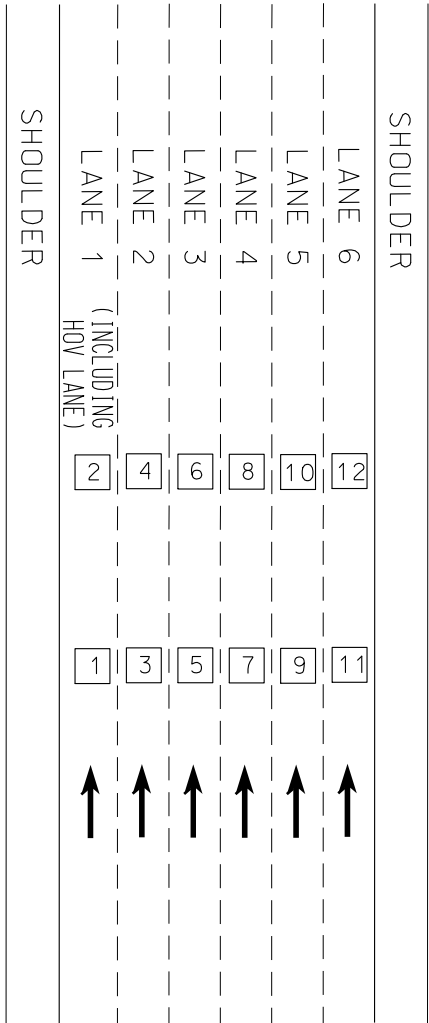
LEGEND

# CABINET DETECTOR NUMBER ASSIGNMENT.

A TMS DETECTION ZONE LAYOUT (TYP)  
AT 18 SOUTHBOUND OR WESTBOUND



B TMS DETECTION ZONE LAYOUT (TYP)  
AT 18 NORTHBOUND OR EASTBOUND



UTAH DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION SALT LAKE CITY, UTAH	REVISIONS	
	NO.	DATE
RECOMMENDED FOR APPROVAL CHAIRMAN STANDARDS COMMITTEE APPROVED	1	2/24/05 S.S. NEW DRAWING
	2	6/23/06 TJM ADDED LANE 6.
DEPUTY DIRECTOR	REMARKS	
TMS DETECTION ZONE LAYOUT	STANDARD DRAWING TITLE	
STD DWG AT 18		

## Section 13551 General ATMS Requirements Comment Resolution Log



### UDOT

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

### Transcore

Todd Mac Gillvray  
Jonny Turner  
Aaron Cloward  
Gerard Kies  
Bob Strong

### Response Code Legend

A - Add or Correct  
B - Clarify or Evaluate  
C - Additional Information Needed  
D - Not Cost Effective / Preference  
E - Disagree  
F - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	All	Todd/Troy	5/2006	Insert all approved 2005 supplemental spec passages into main spec, replacing the old spec passages, and show as approved. This includes 1.3, 2.1, and portions of 3.3 and 3.5.	A	Done.
2	1.1.A, etc.	Todd	5/10/2006	Change all passages referring to "the plans" or "specs" or "details" to the "contract".	A	Agreed.
3	1.2	Todd	5/10/2006	Add related sections 01571, 01721, 02911, 02922 for later additions shown in the new paragraph 3.4	A	Agreed.
4	1.3	Todd	5/10/2006	Update references by clarifying A. with "(nuts, washers, and anchor bolts)", B. with "Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength" consistent with previous changes to VMS spec 13557. Also add in MUTCD, IBC, and NESC references.	A	Done.
5	1.3	Bill	5/25/2006	Consider removing paragraphs J. and K. referring to the REA and RUS bulletins.	E	References still needed since bulletins were reviewed and are needed later in spec.
6	2.1.A.1	Gerard	5/10/2006	Protect the documentation in the cabinet. Use an additional "laminated" copy.	A	Will use "weatherproof sealable sleeve" as agreed.
7	2.1.A.2	Todd	5/10/2006	Modify the website reference to allow a more direct link. From www.udot.utah.gov/index.php/m=c&tid=719 to www.dot.utah.gov/index.php?m=c&tid=332. Clean up Table verbage.	A	Agreed.
8	2.1.A.2	Mark	5/22/2006	Label as Table 1 and refer to properly.	A	Done.
9	2.1.A.2	Deryl	5/22/2006	The need for the test report documentation items 2 through 5 in table are questionable. Get input from Bill's group.	A	Done, and left as is for now. UDOT may not always require all items, but they may need them for maintenance. This allows UDOT ability to ask for as needed.
10	2.2.A	Bill	5/22/2006	Delete IMSA reference and replace with "National Electrical Code (NEC)"	A	Done
11	2.2.C	Bill	5/22/2006	Delete C as is and replace it with G. Clarify G. by adding the word "source" after "Power"	A	Done
12	2.2.E	Bill	5/22/2006	Check this against standard drawing to see if correct.	C	
13	2.2.F	Bill	5/22/2006	Should REA 345-72 be used? Will it affect federal funding if removed? Check NEC for splicing.	B	Yes. UDOT still uses copper and may need to splice to it. No guidance was found on this topic in the NEC.
14	2.2.G	Todd	5/24/2006	Changed and moved to 2.2.C	A	Done
15	2.2.H-I	Aaron C.	5/24/2006	Consider removing these paragraphs since the Department provides these now.	A	Done
16	3.1.A	Bill	5/22/2006	Add "4. Remote Operations Test where communication is established or available."	A	Though this is something typically done by the Integrator, it is required and may, at some point, be required of the prime.
17	3.1.B	Todd	5/10/2006	Alter the website from www.udot.utah.gov/index.php/m=c&tid=719 to www.dot.utah.gov/index.php?m=c&tid=332.	A	Done
18	3.1.B	Mark, Bill	5/22/2006	Add "at least" in front of "five working days", clarify that the "Form" to be used is the one posted "at time of bid", delete "Five-Day" to keep it open-ended, and change "witnesses" to "must witness".	A	Done. The actual name of the form must be updated as part of a separate effort to change from "Five-Day ATMS Testing Prenotification Form" to "ATMS Testing Prenotification Form".
19	3.1.C	Todd	5/10/2006	Change website reference as before.	A	Done.
20	3.2.A, ALL	Todd	5/10/2006	Cleaned up verbage to be more readable and consistent with Spec Writer's Guide.	A	Done.
21	3.2.B	Todd	5/10/2006	Expanded to include "surface" utilities in addition to "underground" and "overhead". Contractor now required to verify existing underground utility markings with potholing. Potholing will not be paid for separately when performing ITS/ATMS work.	A	Done.
22	3.2.B	Bill	5/22/2006	Repeat of Blue Stakes Law. Refer to Blue Stakes Law and rethink paragraph.	B	Redundancy is good in this instance, but the law may be referenced in the future.
23	3.2.H	Todd	5/10/2006	Require the Contractor to identify right-of-way boundaries before starting work, whether this reference information is provided in the plans or not. If not, they need to add money in their bids to do this work so they don't encroach.	A	Done.
24	3.2.H	Bill	5/22/2006	This ROW delineation should be on Designer, not Contractor.	E	In many cases the Designer does show the boundaries in the plans but it is still the Contractor's burden to mark these in the field. In cases where the Designer doesn't show these limits, it's still the Contractor's burden to id his work zone-- the difference being additional research.
25	3.2.J	Aaron C.	5/10/2006	Replace "without power equipment" with "or suction,".	A	Done.
26	3.3	Mark	5/22/2006	Replace "EQUIPMENT" with "MATERIALS" in title.	A	Done.

## Section 13551 General ATMS Requirements Comment Resolution Log



### UDOT

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Mark Parry  
Bill Butterfield

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Gerard Kies  
Bob Strong

### Response Code Legend

A - Add or Correct  
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E - Disagree  
F - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
27	3.3.B	Bill	5/22/2006	Replace B. with "Locations staked in the field, described in the specifications, and dimensioned on the plans and details are approximate. Coordinate with the Engineer to have the Engineer or the Engineer's Agent on-site to field locate all new facilities, e.g., cabinet foundations, camera poles, detector poles, and junction boxes.	B	Done for now. I would consider not doing this. Puts large burden on Contractor and Engineer.
28	3.3.D and E	Bill	5/22/2006	Combine D and E and use 4 feet instead.	A	Combined, but 3 feet was used instead of 4 feet per other UDOT standard drawings and Roadside Design Guide.
29	3.4 new	Todd	5/10/2006	Add new section named "WEED AND EROSION CONTROL" to respond to repetitive needs for controlling weeds and erosion on these projects. Create specific guidelines incorporating special provisions and construction notes from recent ITS projects.	A	Done.
30	3.4	Todd	5/10/2006	Renumber headings after 3.4.	A	Done.
31	3.4.A Excavation	UDOT	5/22/2006	Replace "conditions when excavation is required" with "features."	A	Done.
32	3.4.C	Bill	5/22/2006	Delete and change lettering sequence hereafter.	A	Done.
33	3.4.F	Bill	5/22/2006	Delete and change lettering sequence hereafter.	A	Done.
34	3.4.G	Bill	5/22/2006	Replace "without the approval of the Engineer" with "until inspected and approved by the Engineer". This becomes 3.5.E.	A	Done.
35	3.4.H & I	Bill	5/22/2006	Merge these two paragraphs and edit appropriately.	A	Done. Both paragraphs were replaced by "Protect pedestrian and vehicular traffic from all excavations." These become 3.5.F.
36	3.5.B Anchor Bolts	Bill, etc.	5/22/2006	Delete this paragraph. Reletter thereafter.	A	Agreed and done.
37	3.5.D	Bill, etc.	5/22/2006	Address the need for tightening after the structure is loaded.	A	Done, added "Retighten all nuts after the structure is fully loaded." This becomes 3.6.C.
38	3.6.C	Todd	5/10/2006	Add "(consistent with the current MUTCD) after BUSINESS ACCESS signs, (2) replace "periods when business is open" with "business hours", (3) replace "for businesses with" with "that have", and (4) delete "amount of" and "that the driveway".	A	Done
39	3.6.C	Bill	5/22/2006	Delete entire last two sentences and add "anytime an access is closed" after "apparent".	A	Done
40	3.7 Temporary Traffic Signal Timing	UDOT	5/22/2006	Delete section or consider a notification requirement.	A	A. and B. were replaced with "Notify the Engineer and the Traffic Signal Coordination Engineer for approval before implementing temporary changes." This verbiage may require revision to cover problems that occur over weekends/holidays where Department personnel are unavailable.
41	3.8.A	Bill	5/22/2006	Put information from B. here, add "junction boxes" after "conduit (in-place)", and append "as specified by the Engineer" to the end.	A	Done. This becomes 3.9.A.
42	3.8.C	Todd	5/10/2006	Delete paragraph C.	A	Done.
43	3.9	Todd	5/10/2006	Replace "EQUIPMENT" with "FACILITIES" in title. In 3.9.C., delete "each piece of abandoned ATMS equipment" and add "on" to read, "and on all cables...".	A	Done. This becomes 3.10
44	3.9.C	Bill	5/22/2006	Replace C with "All conductors, except pull wires, being taken out of service are to be removed. If to be abandoned in place, ends must be cut even with end of pipe."	A	Agreed, but reworded to the active voice "Remove all conductors, except pull wires, being taken out of service. Cut the ends even with the end of pipe if abandoning in place."
45	3.10.A.1 Remove and Salvage ATMS Equipment	Todd	5/10/2006	Add "48 hours before removal", "Department", and delete "an", "by the Department", and "prior to removal".	A	Done.
46	3.10.A.1 Remove and Salvage ATMS Equipment	Bill	5/22/2006	Add "Damaged equipment will be replaced at no additional cost to the Department" to end.	A	Done.
47	3.10.A.3	Todd	5/10/2006	Delete and put information in 1.	A	Done.
48	3.10.B	Bill	5/22/2006	Replace "removed" with "salvageable".	A	Done.

**Section 13551 General ATMS Requirements  
Comment Resolution Log**



**UDOT**

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Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**

Todd Mac Gillvray  
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D - Not Cost Effective / Preference  
E - Disagree  
F - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
49	3.10.C	Bill, Mark	5/22/2006	Heading should read "Cable and wiring:". Update Article reference in subparagraph 1.	A	Done.
50	3.11 Electrical	All	5/22/2006	Should be "Electrical" not "Electric" code. Add references to National Electrical Safety Code and International Building Code.	A	Done.
51	3.12.A	Bill	5/22/2006	Replace "powered soapstone, talc or other" with "NEC". Add "and seal" after "Tape" in 2. Check references in 5.	A	We removed "20-1" reference also.
52	3.12.B	Todd	5/10/2006	Delete "In all non-metallic conduit, a" and reword. Delete "except in circuits with less than 50 V" in 2.	A	Done.
53	3.12.C	Bill	5/22/2006	Add "and support" after "arrange".	A	Done.
54	3.12.D	Bill	5/22/2006	Delete last sentence of 2.	B	Done, but we may need to put it back in because RUS and REA references in other spec are still valid.
55	3.13 Maintenance	Bill	5/22/2006	Add "OR REPAIR" to title. Change "maintenance" to "repair response", and replace "hour response" with "hour maximum" in D. Replace "Routine Maintenance" with "Non-emergency repairs", and delete "not of a public safety nature" in E. Reword F as previously.	A	Done. May still need rewording. This becomes 3.14.F.
56	3.14 Location of New Facilities	UDOT	5/22/2006	Move A. to 3.3.	A	Done. This section is now gone.
57	1.1.A	Aaron B	11/20/2006	Match intro from other specs	A	Done
58	2.1.A	Aaron B	12/18/2006	Capitalize Engineer	A	Done
59	Table 1	Aaron B	12/18/2006	Capitalize "Test"	A	Done
60	General	Aaron B	12/18/2006	Capitalize and hyphenate "State-Furnished"	A	Done
61						

# **Section 13552M Ramp Meter Signals and Signing** **Comment Resolution Log**



## **UDOT**

## **Transcore**

Todd MacGillivray  
 John Haigwood  
 Aaron Buchanan  
 Gerard Kies

## **Response Code Legend**

- A** - Add or Correct
- B** - Clarify or Evaluate
- C** - Additional Information Needed
- D** - Not Cost Effective / Preference
- E** - Disagree
- F** - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	General	Todd	6/12/2006	Change all references to plans and details to the contract	A	Comment Incorporated
2	1.4.A	Todd	6/12/2006	Add "provide" at the beginning	A	Comment Incorporated
3	2.1	Todd	6/13/2006	Should we be using AA(AE) or A(AE) everywhere?	A	UDOT says yes, we won't change back what was just changed.
4	2.2.A	Todd	6/12/2006	Change " 8 inch 1 section" to One 8 inch section	A	Comment Incorporated
5	2.2.B	Todd	6/12/2006	Remove "For"	A	Comment Incorporated
6	2.2.D	Todd	6/12/2006	Add "and 2 VEHICLES PER GREEN" and move "24 inch x 18 inch" to after the sign names.	A	Comment Incorporated
7	2.2.E	UDOT	6/19/2006	Add "highway" before "yellow"	A	Comment Incorporated
8	2.2.G	Todd	6/12/2006	Remove.	A	Comment Incorporated
9	2.2.H	Todd	6/12/2006	Remove "Provide" and change "SL" to "SN"	A	Comment Incorporated
10	2.3.A	Todd	6/12/2006	Change "For" to "All"	A	Comment Incorporated
11	2.3.B	Todd	6/12/2006	Add "and 2 VEHICLES PER GREEN" and move "60 inch x 36 inch" to after the sign names.	A	Comment Incorporated
12	2.3.C	UDOT	6/19/2006	Add "highway" before "yellow"	A	Comment Incorporated
13	2.4.C	Todd	6/12/2006	Move "Metering when flashing sign" to beginning of paragraph	A	Comment Incorporated
14	2.4.D	UDOT	6/19/2006	Add "highway" before "yellow"	A	Comment Incorporated
15	2.4.F	Todd	6/12/2006	Remove.	A	Comment Incorporated
16	2.4.G	Todd	6/12/2006	Remove "Provide", change "snow plow activity" to "thrown snow", and change "SL" to "SN"	A	Comment Incorporated
17	2.5.B	Todd	6/12/2006	Add paragraph "Follow section 13551 for Anchor Bolts"	A	Comment Incorporated
18	2.6.A	UDOT	6/19/2006	Remove first sentence, Let the designer spec. Capitalize "Section"	A	Comment Incorporated
19	2.7.B	UDOT	6/19/2006	Remove.	A	Comment Incorporated
20	2.8.C	UDOT	6/19/2006	Remove "if 480 volt power service is not available"	A	Comment Incorporated
21	3.1.F	Todd	6/12/2006	Replace with "Clean equipment exterior of all rust and mill scale, dirt, oil, grease and other foreign substances after installation."	A	Comment Incorporated
22	3.2.B	Todd	6/12/2006	Don't use "prior to". Reword sentence about locations and remove "underground and overhead"	A	Comment Incorporated
23	3.2.D	Todd	6/12/2006	Change "Excavation" to "Excavate for foundations"	A	Comment Incorporated
24	3.2.E	Todd	6/12/2006	Switch the location of the last sentence before the list with the first listed sentence	A	Comment Incorporated
25	3.2.G	Todd	6/12/2006	Switch the order of the sentence. Say what to do first and what not to do second.	A	Comment Incorporated
26	3.2.H	UDOT	6/19/2006	Use lower case for reinforcing steel	A	Comment Incorporated
27	3.2.I	Todd	6/12/2006	Remove first sentence about concrete.	A	Comment Incorporated
28	3.8.B	Todd	6/12/2006	Put first phrase at end of the sentence	A	Comment Incorporated
29	3.8.B	UDOT	6/19/2006	Remove sentence	A	Comment Incorporated
30	3.8.E	Todd	6/12/2006	Reword 3.8.E and verify meaning	A	Changed to "Install ramp meter signal head"
31	3.9.B	Todd	6/12/2006	Put first phrase at end of the sentence	A	Comment Incorporated
32	3.9.C	Todd	6/12/2006	Put first phrase at end of the sentence	A	Comment Incorporated
33	3.9.C	Todd	6/12/2006	Consider removing part about circular or octagon shape. Concrete cutting should be circular	A	Shapes spec removed
34	3.11.B	Todd	6/12/2006	Add that Local FOT should take place before the opening of all lanes of traffic	F	isn't needed
35	3.11.B	Todd	6/12/2006	Update weblink. It should be for 332 not 719. Also, make updates consistent with 13591 changes since they're similar.	A	Comment Incorporated
36	1.1.A	Aaron B	11/20/2006	Change intro to match other specs	A	Comment Incorporated
37						



# **Section 13553 ATMS Conduit and AT 6** **Comment Resolution Log**



**UDOT**  
Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Rich  
Bill Butterfield

**Transcore**  
Todd MacGillivray  
Aaron Buchanan  
Aaron Cloward  
Shelby Hansen

**Response Code Legend**  
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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	2.1.J	Shelby	8/10/2006	Change "amps" to "A"	A	Comment Incorporated
2	3.1.I	Shelby	8/10/2006	change "details" to "contract"	A	Comment Incorporated
3	3.1.M	Shelby	8/10/2006	Why and/or? Should it be "and as approved by the Engineer"?	A	Comment Incorporated
4	3.2.D	Shelby	8/10/2006	Add "specifications" to railroad	A	Comment Incorporated
5	3.2.H	Shelby	8/10/2006	Format title and add "in highway right-of-way" to subparagraph 3.	A	Comment Incorporated
6	3.3.H	Shelby	8/10/2006	Change decimal to fraction	A	Comment Incorporated
7	3.3.I	Shelby	8/10/2006	Change decimal to fraction	A	Comment Incorporated
8	3.5.B	Shelby	8/10/2006	Change "prior to" to "before"	A	Comment Incorporated
9	3.5.B	Shelby	8/10/2006	Check grammar and add that conditions need to be at original or better	A	Comment Incorporated
10	3.6.B	Shelby	8/10/2006	Advise the engineer of necessary repairs rather than advise.	A	Comment Incorporated
11	2.1.B	Aaron B	9/13/2006	Change "Multi" to "Non-Metallic"	A	Comment Incorporated
12	2.1.B	Aaron B	9/13/2006	Remove Paragraph 2	A	Comment Incorporated
13	2.1.B	Aaron B	9/13/2006	Add Multi-duct to conduit types	A	Comment Incorporated
14	2.1.B	Aaron B	9/13/2006	Add colors for multi conduit types less than 1D	A	Comment Incorporated
15	2.1.B	Aaron B	9/13/2006	reword "one conduit" to "four conduits"	A	Comment Incorporated
16	2.1.F	Aaron B	9/13/2006	Format fractions	A	Comment Incorporated
17	2.1.G	Aaron B	9/13/2006	Add locatable to pull tape	A	Comment Incorporated
18	2.1.G	Aaron B	9/13/2006	Delete cell reference	A	Comment Incorporated
19	2.1.I	Aaron B	9/13/2006	Remove info about 1" conduit	A	Comment Incorporated
20	2.1.L	Aaron B	9/13/2006	Include paragraph that says materials must be approved by engineer	A	Comment Incorporated
21	3.1	Aaron B	9/13/2006	Flowable fill requirements around junction boxes and excavations were added to the Junction Box spec. This should be put in this spec and the junction box spec should refer to this.	A	Added as 3.1.S
22	3.1.G	Aaron B	9/13/2006	From Gerard: add "joint to joint"	A	Comment Incorporated
23	3.1.K	Aaron B	9/13/2006	From Gerard: have GPS coordinates shown on as-builts	A	Comment Incorporated
24	3.1.N, 3.1.O	Aaron B	9/13/2006	Move paragraph about attaching conduit to 3.1.O. Replace with requirements about when to bore.	A	Added "All conduit crossing of roadways will be done by boring. All surface street conduit installation will be done by boring. Where curb and gutter is present, install conduit under park strip" to minimize impacts to residents and business.
25	3.1.Q	Aaron B	9/13/2006	From Gerard: subparagraph 2 should probably be changed to 2,000 feet.		See comment 63
26	3.1.R	Aaron B	9/13/2006	Locate wire to be installed in conduit with fiber not in 1-inch conduit	A	Comment Incorporated
27	3.1.R	Aaron B	9/13/2006	From Gerard: It is suggested that the terminal block be removed and the locator wire should be attached directly to the ground rod with a few feet of slack	A	Comment Incorporated
28	3.2.A.2	Aaron B	9/13/2006	Change "prior to" to "before"	A	Comment Incorporated
29	3.2.A.6	Aaron B	9/13/2006	Format fractions	A	Comment Incorporated
30	3.2.B.1	Aaron B	9/13/2006	Change "6" to "8"	A	Comment Incorporated
31	3.3.B	Aaron B	9/13/2006	Move paragraph about steel conduit being above ground to 3.1 and add requirements for transition from Steel to PVC. Not only for trenching.	A	Transition requirement from steel to PVC not needed.
32	3.3.C	Aaron B	9/13/2006	Remove "If flowable fill is used"	A	Comment Incorporated
33	3.3.E	Aaron B	9/13/2006	Remove "in order to"	A	Comment Incorporated
34	3.3.F	Aaron B	9/13/2006	Format fractions	A	Comment Incorporated
35	3.3.G	Aaron B	9/13/2006	Change "prior to" to "before"	A	Comment Incorporated
36	3.3.H	Aaron B	9/13/2006	Change "cluster" to "bank"	A	Comment Incorporated
37	3.3.J	Aaron B	9/13/2006	Remove info about 1" conduit	A	Comment Incorporated
38	3.3.K	Aaron B	9/13/2006	Change "6" to "8"	A	Comment Incorporated
39	3.4.A	Aaron B	9/13/2006	Change "prior to" to "before"	A	Comment Incorporated
40	3.5.C	Aaron B	9/13/2006	Change "plans" to "contract"	A	Comment Incorporated
41	3.6.A	Aaron B	9/13/2006	Remove "that were"	A	Comment Incorporated
42	2.1.I	Aaron C	9/14/2006	Locate wire should be #14 THWN solid green and should be in all conduits with fiber.	A	Comment Incorporated
43	2.1.I	Todd	9/14/2006	Does this locate wire require insulation or is it understood	B	It is understood in the THWN call out
44	3.1.L	Todd	9/14/2006	Add "locatable" to pull tape	A	Comment Incorporated
45	3.4.B	Todd	9/14/2006	Follow 3.3 only for exposed locations of conduit	A	Comment Incorporated
46	1.1.B	Bill	9/20/2006	Change Mule tape to pull tape throughout.	A	Comment Incorporated
47	2.1.B.2	Deryl	9/20/2006	Remove paragraph	A	Comment Incorporated
48	2.1.B.4	Rich, Bill	9/20/2006	Check NEC color code and National Standards for conduit coloring. Grey should be the color for 1-3 conduits. Remove subparagraphs a, b, and c.	A	Can't find anything in NEC on conduit color coding. Entered gray for 1-3 conduits. (Aaron C suggestion)
49	2.1.B.4	Rich	9/20/2006	Remove "four conduits of" in paragraphs d, e, and f.	A	Comment Incorporated
50	2.1.D	Rich	9/20/2006	What are the kits. Make consistent with Junction Box spec. Remove	A	Comment Incorporated
51	2.1.E	Bill	9/20/2006	Replace "complete" with "PVC"	A	Comment Incorporated
52	2.1.F	Bill	9/20/2006	Remove "complete"	A	Comment Incorporated
53	2.1.G	Bill, Rich	9/20/2006	Check pull tape strength. Fiber max is 600 lbs. Maybe 1200 lbs is better. Add this paragraph to junction box spec.		Added to Junction Box. Either one is fine, 2500 is standard, and 1200 will only slightly reduce the cost.
54	2.1.I	Deryl	9/20/2006	Watch use of "provide."	A	All Material Items have "provide" removed
55	2.1.J	Rich	9/20/2006	Remove. See comments from Junction Box Specs.	A	Comment Incorporated
56	2.1.L	Rich	9/20/2006	Replace "Submit all materials for approval by Engineer." with "Submit all material certifications to Engineer for approval."	A	Comment Incorporated
57	3.1.C	Bill	9/20/2006	Add " and bends" after "deflection of conduit"	A	Comment Incorporated
58	3.1.G	Bill	9/20/2006	Remove hyphen, and replace "damaged section" to "damaged concrete sections".	A	Comment Incorporated
59	3.1.J	Aaron B	9/20/2006	Change "prior to" to "before"	A	Comment Incorporated
60	3.1.L.1	Aaron B, Bill	9/20/2006	Replace "Install locatable Mule tape" with "Provide pull tape".	A	Comment Incorporated
61	3.1.O	Rich	9/20/2006	Add "concrete" before "structures" and replace "concrete expansion anchors per manufacturer's requirements" with "approved anchoring system".	A	Comment Incorporated
62	3.1.P	Rich	9/20/2006	Change "less than" to "a maximum of"	A	Comment Incorporated

**Section 13553 ATMS Conduit and AT 6**  
**Comment Resolution Log**



**UDOT**  
Troy Torgerson  
Deryl Mayhew  
Mark Parry  
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Bill Butterfield

**Transcore**  
Todd MacGillivray  
Aaron Buchanan  
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63	3.1.Q	All	9/20/2006	3,000 feet is questionable for highway installations. Check At&T book	A	Contractors suggest 1,500 ft for wavy trenched conduit and 2,500 ft for bored or plowed conduit. Aaron C. suggests 2000' . 2,500 entered.
64	3.1.R	Bill, Rich	9/20/2006	Remove subparagraphs 2 and 3.	A	Comment Incorporated
65	3.2.A.2	Bill	9/20/2006	Add "surface" after the first "roadway"	A	Comment Incorporated
66	3.2.B.1	Todd	9/20/2006	Remove "roadway"	A	Comment Incorporated
67	3.2.G	Rich	9/20/2006	Add paragraph saying "Sleeve foreign conduit that crosses a trench" to ensure that they are not encased in flowable fill"	A	Comment Incorporated
68	3.3.D	Bill, Rich	9/20/2006	Paragraph should be moved to 3.1, its not exclusive to trenching. If NEC says that bushings or adapters are required for nonmetallic conduit then don't remove first sentence. Remove "to protect conductor from abrasion."	B	Bushings and adapters should be installed to ensure that conduit is not torn up as it is being pulled through
69	3.3.F	Mark	9/20/2006	Replace "pouring" with "placing"	A	Comment Incorporated
70	AT 6	Rich	9/20/2006	Add "typ" next to 1 1/2 inch between wall and conduit.	A	Comment Incorporated
71	AT 6	Rich	9/20/2006	In note 2, change "seal coat" to "surface coarse"	A	Comment Incorporated
72	AT 6	Todd	9/20/2006	Note 3 will change to "Encase all open trench in flowable fill. Encase plowed and bored conduit in flowable fill at exposed locations, splice points, and box connections"	A	Comment Incorporated
73	AT 6	Rich	9/20/2006	Change Mule tape to pull tape throughout.	A	Comment Incorporated
74	1.1	Aaron B	10/2/2006	Reword 1.1 and match with other specs	A	Comment Incorporated
75	1.1.A	Aaron B	10/2/2006	Change "Furnish and install" to "Materials and procedures for	A	Comment Incorporated
76	1.1.B	Aaron B	10/2/2006	Remove 1-inch conduit	A	Comment Incorporated
77	2.1.C	Aaron B	10/2/2006	Match junction box spec on sealing the sized conduit	A	Comment Incorporated
78	2.1.C	Aaron B	10/2/2006	Put all information regarding conduit plugs from Junction Box spec and put in Conduit Spec. Refer junction box spec to Conduit spec.	A	Comment Incorporated
79	3.2	Aaron B	10/13/2006	Cover of Conduit should be general installation (3.1) not for trenching only.	A	Comment Incorporated
80	3.2.3.3	Aaron B	10/13/2006	Combine these sections	A	Comment Incorporated
81	2.1.E	Aaron B	10/17/2006	Remove last sentence and put in Execution	A	Comment Incorporated
82	3.1	Todd	11/15/2006	Add paragraph saying "DEPARTMENT will not grant additional time or money for installing conduit in difficult subsurface conditions"	A	Comment Incorporated
83	3.2.A	Aaron B	12/18/2006	Joint sealant is in note 1 of AT 6 but not in the spec. Tack coat is in the spec but not on AT 6. Tack coat should be applied on backfill before the patch is installed	A	Both the spec and AT 6 have been updated.
84	3.5.B	Mike Mauritz	12/14/2006	This implies that only fiber is installed in existing conduit. Is that the case? Would we ever install copper conductors in this conduit?	A	Copper conductors can be installed in existing conduit. This paragraph has been reworded.
85	2.1.F	Mike Mauritz	12/14/2006	The plans show a 24" sweep in DT-10, but the spec requires 36 inch sweeps. 3.1.F clarifies the difference, but 2.1.F is inconsistent.	A	The mention of 36" is removed. The two sizes are mentioned later.
86						

## Section 13554 Polymer Concrete Junction Box and AT 7 Comment Resolution Log



### UDOT

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Scott  
Rich  
Bill Butterfield

### Transcore

Todd MacGillivray  
Aaron Buchanan  
Aaron Cloward  
Gerard Kies

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	2.1.A	Aaron B	8/22/2006	This is an execution item. Relocate	A	Removed "Finish grout smooth and flush with interior wall" and put it in 3.2.B
2	2.1.J	Aaron B	8/22/2006	Match standard drawing for a terminal block	B	Removed all references to terminal blocks. Refer to comment 49
3	2.2.H	Aaron B	8/22/2006	Put info from standard drawing on bolts in spec in this paragraph	B	Bolt sizes wrong. See comment 58.
4	2.4	Aaron B	8/22/2006	Relocate paragraph to Execution	A	Relocated to 3.1 Renumbered articles
5	2.4	Aaron B	8/22/2006	Should we specify the 15 pound felt paper shown on the standard drawing	B	Removed all references to felt paper. See comment 78.
6	2.5.A	Aaron B	8/22/2006	Is there some type of standard that this is referring to?	B	See Comment 28
7	2.6	Aaron B	8/22/2006	Detail from Standard Drawing should be included here. Combine Paragraphs A and B	A	Changed sentence to "8 ft x 5/8 inch copper-coated steel ground rod as specified by ANSI/UL 467"
8	3.2.D	Aaron B	8/22/2006	Put this paragraph with the relocated section 2.1.A	A	Now in section 3.1
9	3.2.E	Aaron B	8/22/2006	Remove this paragraph, we do install them in the Right-of-Way, but it should be on the plans and not the specifications	A	Deleted paragraph E and relettered
10	3.2.H	Aaron B	8/22/2006	Change "prior to" to "before"	A	Comment Incorporated.
11	3.2.J	Aaron B	8/22/2006	Conduit should be in bottom half of junction box	A	Replaced "at least three" with "in the bottom half of the junction box wall at least 3"
12	3.2.M	Aaron B	8/22/2006	Drawing shows felt paper, should be in spec	B	See Comment 78
13	1.2	Aaron B	8/23/2006	Need reference to Survey	A	Added "A. Section 01721: Survey". Relettered other paragraphs
14	3.3.C	Aaron B	8/23/2006	Reword, match standard drawing	A	Changed paragraph C to "Install concrete collars around junction boxes in all locations except where junction boxes are in paved surfaces."
15	2.2.B	Aaron C	8/28/2006	I would recommend that we modify this to state something like within 20' of the edge of pavement use Load rating 1, etc. This takes the guesswork out, and if the road is widened etc, it would be OK?	B	See Comment 52
16	2.2.D	Aaron C	8/28/2006	Could this be combined with 2.2.F	A	yes. Make it so.
17	2.2.G	Aaron C	8/28/2006	I would like to see if we could add an option for 2 piece lids for all Type III lids	B	We'll look into it based on what T&S gets from procurement.
18	2.3	Aaron C	8/28/2006	Delete, use of GPS coordinates should suffice	E	See comment 45
19	2.5	Aaron C	8/28/2006	I would add a line for allowing 2" of duct seal for all conduits which contain conductors or fiber. Approved plugs in all others.	B	Maybe in the future. We'll talk it over further.
20	3.2.F	Aaron C	8/28/2006	Field locating should be approved by engineer	A	Inserted "with engineers approval"
21	3.2.G	Aaron C	8/28/2006	Phrase about approaches to signals could be removed because there may be times when the plans will call out to violate this, but should be on a case by case basis.	A	Comment Incorporated.
22	3.2.I	Aaron C	8/28/2006	There is some discussion about if 2" is the correct amount or not. This needs discussed at the review meeting with UDOT	A	See Comment 70
23	3.2.K	Aaron C	8/28/2006	This can be removed, as there is an access point on both sides of the lid	A	Comment Incorporated.
24	3.2.N	Aaron C	8/28/2006	This should match the standard drawing which is 1/2" expansion.	A	Inserted "1/2 inch"
25	3.2	Aaron C	8/28/2006	Include paragraph on flowable fill.	A	Added "M. Install flowable fill around all conduits where they enter the junction box. Flowable fill all excavated areas where conduit is installed."
26	3.2.O	Gerard	9/14/2006	This was removed in the previous Supplemental but should include putting coordinates in as-builts	A	Changed "Section 13551" to "Section 01721 and show on as-built drawings."
27	2.2.B	Todd	9/14/2006	This should all be deleted if we leave the recent changes to using only a Load Rating 1 lid per AT 7.	A	Deleted sub paragraphs 1 and 2. See Comment 52
28	2.5.A	Todd	9/14/2006	Reword sentence	A	Changed sentence to "Use conduit plugs that can seal the sized conduit used and allow the secure fastening of locatable Mule Tape"
29	1.2	Todd	9/15/2006	Need reference to Flowable Fill	A	Added "G. Section 03575: Flowable Fill". Relettered other paragraphs
30	2.1	Todd	9/15/2006	Specify flowable fill material	A	Added "D. Use flowable fill per Section 03575"
31	2.1.D	Todd	9/15/2006	If GPS coordinates are used than no need for maintenance markers.	C	Deleted "Provide maintenance markers for junction boxes along freeways and expressways" Refer to comment 45
32	2.1.E	Todd	9/15/2006	Clarify Concrete wording	A	Replaced "concrete AA(AE)" and replace with "Class AA(AE)". Remove parentheses from the reference to Section 03055.
33	2.2.F.4	Todd	9/15/2006	Let's evaluate the communications marking. Is this still good?	C	See comment 45
34	2.2.G	Todd	9/15/2006	Don't have tem try and repair damage, have the lid replaced	A	Changed "Repair" to "Replace" See comment 56
35	3.2.B.3	Todd	9/15/2006	Need to include Mule tape	B	Added "(with locatable Mule Tape attached)" See comment 68
36	3.2.I	Todd	9/15/2006	Multi-duct conduit should have colors matching on both sides of junction boxes	A	Inserted "Align conduit ends by color at each side of the box"
37	3.4.B	Todd	9/15/2006	Clamps should be approved	A	Comment Incorporated.
38	3.5.A	Todd	9/15/2006	Restoration should not be change orders	A	Added "at no additional cost to the department"
39	General	Scott	9/20/2006	Boxes should not stacked.	A	Comment Incorporated.

## Section 13554 Polymer Concrete Junction Box and AT 7 Comment Resolution Log



### UDOT

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
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Bill Butterfield

### Transcore

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D - Not Cost Effective / Preference  
E - Disagree  
F - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
40	General	Scott	9/20/2006	Compare this spec with the Traffic and Safety Procurement Spec	C	See Comment 86
41	General	Rich, Scott	9/20/2006	Why are we going with Polymer Concrete? They are heavy and break easily. As long as we maintain the load rating, we can consider using other alternatives.	B	Resolve at a later time after a QIT for other options
42	General	Deryl	9/20/2006	Check use of "Provide". Too often used.	A	Section 2 changed to remove preceding verbs.
43	1.3.I	Scott	9/20/2006	Delete paragraph. ASTM C 580 is the accurate test.	A	Comment Incorporated.
44	2.1.A	Rich	9/20/2006	What kits is this referring to? If holes are too big, fill sides with grout. Suggest taking this paragraph out. Flowable fill should form a watertight seal.	A	Termination kits were removed. Grout should be used to ensure watertight seal.
45	2.1.D	Rich	9/20/2006	GPS locations won't be enough. People in the field won't always have GPS units. Use maintenance markers instead.	B	Maintenance markers remain in spec, but this paragraph is moved to Section 3
46	2.1.D	Bill	9/20/2006	One alternative is to have a signal wire attached to the ground rod extending a few feet perpendicular from the junction box to allow locators to triangulate the box location.	B	Comment 45 is the accepted locatable source.
47	2.1.G	Scott, Troy	9/20/2006	Remove "D790 7500 psi" Replace with "C580 1800 psi". Move Table down to Section 2.2	A	Comment Incorporated.
48	2.1.H, 2.1.I	Scott	9/20/2006	ASTM references are tests. They tell nothing of what the limiting value is. Add to table 1 and provide value.	C	Procurement spec says that the bx must be tested according to the tests and that the results should be available upon request. Match this spec.
49	2.1.J	Rich, Bill	9/20/2006	Remove paragraph. Terminal blocks are not typically installed and not needed. In section 3 say that ground wire should be wrapped around ground rod.	A	Paragraph removed. Is wrapping wires around ground rod better than clamps?
50	2.2	Troy, Todd	9/20/2006	Section 2.1 and 2.2 should be meshed together or seperated more appropriately.	A	Comment Incorporated.
51	2.2.A	Scott	9/20/2006	Put water absorption in table 1 with limiting value. See comment 9.	C	Procurement spec says that the bx must be tested according to the tests and that the results should be available upon request. Match this spec.
52	2.2.B	Scott	9/20/2006	There is only one load rating now. Remove paragraph and replace with wording from Procurement spec.	A	Comment Incorporated.
53	2.2.C	Mark	9/20/2006	Move paragraph to section 3 and include details of grout product in 2.1	C	What specifications are required for grout?
54	2.2.E	Troy	9/20/2006	Move to Table 1	A	Moved. What about no coating requirement?
55	2.2.G	Rich, Bill	9/20/2006	Access points break off leav nails sticking up. Prefer U-bolts with metal plate under lid. Check procurement spec 2.7	A	Matched Procurement spec instead
56	2.2.G	Rich	9/20/2006	Remove "Replace damage to the pulling point in the lid" to "Replace lid if pulling point is damaged"	A	Comment Incorporated.
57	2.2.H	Bill, Scott	9/20/2006	Discussion occurred whether hex, penta or no bolts are preferred. Hex was chosen.	A	Comment Incorporated.
58	2.2.H	Scott	9/20/2006	Bolt sizes are incorrect and vary on box type. Add details to table in drawing and refer to the AT series standard drawing.	A	Comment Incorporated.
59	2.3	Bill	9/20/2006	If maintenance markers are the preferred locating method, keep article and change to fiber glass.	A	Comment Incorporated.
60	2.4.A	Rich	9/20/2006	Change Mule tape to pull tape throughout. Materials should describe tensile strength and other properties of pull tape or refer to the conduit spec.	A	Materials referenced to Conduit Spec. Comment Incorporated.
61	2.7	Scott	9/20/2006	Add new paragraph "Expansion Material". Material is called expansion joint felt.	A	Section 02752 calls it expansion joint material and references Section 03152. Added paragraph to match this and call out 1/2 inch thickness.
62	3.1.A	Deryl	9/20/2006	Change "compact" to "place"	A	Comment Incorporated.
63	3.1.A	Troy	9/20/2006	Remove reference to Section 02061.	A	Comment Incorporated.
64	3.1.B	Rich	9/20/2006	Remove paragraph. Redundant with paragraph C	A	Comment Incorporated.
65	3.1.C	Bill, Rich	9/20/2006	Include compactable native soil. Add "collar" at end of sentence. Check dimensions on 4"	A	should be 8"
66	3.2.A	Bill	9/20/2006	Manufacturers instructions are contrary to items in this spec.	C	What items are contrary and to which approved vendor?
67	3.2.B	Rich	9/20/2006	Change "Cast" to "Precast" and remove "at the time of precasting". Remove "structural"	A	Comment Incorporated.
68	3.2.B.3	Rich	9/20/2006	Make consistent with conduit spec	A	Refer to conduit spec instead of repeating
69	3.2.H	Rich	9/20/2006	Change "all conduits" to "all metallic conduit".	A	Comment Incorporated.
70	3.2.I	Rich	9/20/2006	Change "Extend all conduit 2 inches" to "Extend all conduit a minimum of 2" and a maximum of 6 inches"	A	Comment Incorporated.
71	3.2.M	Rich	9/20/2006	Remove all reference to felt paper under the junction box	A	Deleted whole paragraph and put "12 inches deep" in 3.1.
72	3.2	Scott	9/20/2006	Add new paragraph "Secure expansion joint material to the box before placing concrete collar."	A	Added to 3.3
73	AT 7	Scott	9/20/2006	Remove Table 1 and rename Table 2 to Table 1. Remove Load rating designation in Table 2.	A	Comment Incorporated.
74	AT 7	Scott	9/20/2006	Reference the bolt sizes to the Box and Lid Dimensions and add bolt sizes column to table.	B	Bolt sizes differ between manufacturers. Removed bolt sizes.
75	AT 7	Bill	9/20/2006	Add "Compactable native soil or" to "Granular Backfill borrow"	A	Comment Incorporated.
76	AT 7	Rich	9/20/2006	Remove terminal block and reroute wire to ground rod.	A	Comment Incorporated.
77	AT 7	Rich	9/20/2006	Change "2" " to "2" - 6" "	A	Comment Incorporated.

## Section 13554 Polymer Concrete Junction Box and AT 7 Comment Resolution Log



### UDOT

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Scott  
Rich  
Bill Butterfield

### Transcore

Todd MacGillvray  
Aaron Buchanan  
Aaron Cloward  
Gerard Kies

### Response Code Legend

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
78	AT 7	Rich	9/20/2006	Remove felt paper	A	Comment Incorporated.
79	AT 7	Bill	9/20/2006	Note 3 should either be removed or have more exceptions described	A	Comment Incorporated.
80	AT 7	Bill	9/20/2006	Replace "within paved areas" to " within concrete paved areas"	A	Comment Incorporated.
81	2.1.F	Aaron B	9/21/2006	Last sentence is redundant. No reference to "plans" instead refer to Standard drawings	A	Replaced "per the size and type specified in the plans. Boxes are made from polymer concrete." with ". Refer to AT series Standard Drawings for dimensions of junction box types."
82	1.1.A	Aaron B	9/22/2006	Replace "Furnish and install polymer concrete junction box, ground rod, and maintenance marker" with "Materials and procedures for installing polymer concrete junction boxes, ground rods, and maintenance markers"	A	Comment Incorporated.
83	2.1.G	Aaron B	9/22/2006	Table should have a title	A	Added title "Physical and Chemical Properties of Junction Box Components"
84	3.2.B.2	Aaron C	9/21/2006	This needs to match the above specifications.	E	Not needed
85	2	Aaron B	9/25/2006	Section 2 should be re organized. Fill should be its own section, so should concrete collar. The remaining items can be added to 2.2 on Junction boxes.	A	Comment Incorporated.
86	2.2	Aaron B	1/5/2007	Modify 2.2 to match procurement spec	A	Paragraphs B, C, D, and H have been modified accordingly.
87						

## Section 13555 ATMS Cabinet, AT 8, & AT 9 Comment Resolution Log



### UDOT

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

### Transcore

Todd Mac Gillvray  
Jonny Turner  
Aaron Cloward  
Gerard Kies  
Bob Strong

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	2.2.B	Jonny	5/9/2006	Refer to standard drawing AT 9	A	Comment Incorporated
2	2.2.B	Todd	5/10/2006	Format Fractions	A	Comment Incorporated
3	2.4.B	Jonny	5/9/2006	Minimum spacing from edge of junction box to the edge of pavement is 6 inches	A	Comment Incorporated, but 10 inches will be spec'd per std drawing.
4	2.4.B	Todd	5/10/2006	Reworded Comment 2 to say provide a 6 inch concrete collar.	E	Comment 3 accepted
5	General	Todd	5/10/2006	Change "prior to" to "before"	A	Comment Incorporated
6	3.2.F	Jonny	5/9/2006	36 minimum clearance should be the setback required in Section 13551	A	Comment Incorporated
7	3.2.H	Todd	5/10/2006	Refer to contract, not plans	A	Comment Incorporated
8	3.2.H	Jonny	5/9/2006	Replace conduit sizes with a reference to the standard drawings. No need to have them listed in both places.	A	Comment Incorporated
9	3.2.H.8	Jonny	5/9/2006	Have bushings consistent regardless of material	A	Comment Incorporated
10	3.2.H.9	Jonny	5/9/2006	Remove stub of 3" sentence...this conflicts with the standard drawing that shows 2".	A	Comment Incorporated
11	3.2.I	Jonny	5/9/2006	Reword to say that the foundation should be parallel to the roadway	A	Comment Incorporated
12	3.2.J	Jonny	5/9/2006	Chamfer around the top of the cabinet before cabinet installation	A	Comment Incorporated
13	3.2.K	Jonny	5/9/2006	Replace "Bituminous" with "Preformed expansion material" and remove the reference to Section 03152. The section is already in 2.7 and doesn't contain any Execution items	A	Comment Incorporated
14	3.3.E	Jonny	5/9/2006	Caulk must form a watertight seal	A	Comment Incorporated
15	3.3.F	Deryl	5/22/2006	Orient cabinet on foundation with the vented door downstream	A	Comment Incorporated
16	1.5.E	Aaron	11/15/2006	NEC should be "electrical" not "electric"	A	Comment Incorporated
17	2.2.B	Aaron	11/15/2006	Refer to the AT Series, not a specific sheet	A	Comment Incorporated
18	3.2.C	Aaron	11/15/2006	Remove mention of Concrete AA(AE), it is a material item not an execution item	A	Comment Incorporated
19	3.1.C	Todd	12/4/2006	Add "original" before condition and replace "prior to" with "before"	A	Comment Incorporated
20	Footer	Todd	12/4/2006	Put project approval date in footer.	A	done
21	AT 8	Todd	5/10/2006	Rotate the plan view 180 degrees and show the direction of traffic	A	Comment Incorporated
22	AT 8	Todd	5/10/2006	Show which door is ventec	A	Comment Incorporated
23	AT 8	Jonny	5/10/2006	Remove specifics about conduit location in the junction box. Change to "Conduit Location"	A	Comment Incorporated
24	AT 8	Todd	5/10/2006	Change "Bituminous" to "Preformed Expansion"	A	Comment Incorporated
25	AT 8	Jonny	5/9/2006	Show ground wire from entering conduit going to the ground rod.	A	Comment Incorporated
26	AT 8	Aaron B	12/18/2006	Pull the dimensions to the corner of the pad	A	Comment Incorporated
27	AT 8	Gerard Kies	5/10/2006	Find conflict in conduit placement and cabinet. Some conduit not accessible once cabinet has been installed.	A	Added General Note 2: FIELD VERIFY CONDUIT LAYOUT IN CABINET FOUNDATION TO AVOID CONFLICT WITH CABINET.
28	AT 8	Gerard Kies	5/10/2006	As junction boxes and collars are present – felt necessary to refer to that Std Dwg.	A	Added General Note 3: SEE STD DWG AT 7 FOR TYPICAL ATMS JUNCTION BOX INSTALLATION.
29	AT 8	Jonny Turner/Gerard Kies	5/10/2006	Added clarification for conduit layout – referencing Note 2	B	See Comment 23
30	AT 9	Gerard Kies	5/10/2006	Edges of mounting strut often dangerously sharp.	A	Added General Note 2: ROUND OFF SHARP EDGES OF STRUCTURAL TUBING
31	AT 9	Gerard Kies	5/10/2006	Once holes have been drilled into boxes, they are no longer water-tight, requiring water-tight gaskets. Also need galvanized hardware to prevent oxidation	A	Added General Note 3: ATTACH TRANSFORMER AND DISCONNECT TO FRAMING STRUT WITH WATER TIGHT GASKETS AND GALVANIZED HARDWARE
32	AT 9	Jonny Turner	5/10/2006	Path shown indicates that they are reversed as the power goes from the transformer to the disconnect	A	Swap location of transformer and disconnect
33	AT 9	Jonny Turner	5/10/2006	Appears as though the arrow points to the bushing, not the conduit	A	Show 2" rigid metal conduit note pointing at the 2" conduit
34	AT 9	Todd	5/10/2006	Depth of conduit is not shown	A	Added General note 4: For conduit depth refer to 13553

**Section 13555 ATMS Cabinet, AT 8, & AT 9  
Comment Resolution Log**



**UDOT**

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**

Todd Mac Gillivray  
Jonny Turner  
Aaron Cloward  
Gerard Kies  
Bob Strong

**Response Code Legend**

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35	AT 8.9	Jonny Turner	5/10/2006	Concrete is AA(AE) not AA(A.E.)	A	Comment Incorporated
36	AT 9	Jonny Turner	5/10/2006	Change conduit size to 3"	A	Comment Incorporated
37	AT 9	Jonny Turner	5/10/2006	Remove the conduit wrap line type, don't show the conduit going through the foundation and don't show the wire in the conduit	A	Comment Incorporated
38	3.3.F	Aaron B	12/18/2006	Unbold this sentence.	A	Comment Incorporated
39	2.7	Aaron B	1/5/2007	Update this to match 3.2.K.	A	Comment Incorporated
40						



## Section 13561 ATMS Power Service Comment Resolution Log



**UDOT**  
Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**  
Todd Mac Gillvray  
Jonny Turner  
Aaron Cloward  
Gerard Kies  
Bob Strong  
Aaron Buchanan

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1	1.1.A	Todd	5/10/2006	Change all references of plans, drawings, and specs to contract	A	Comment Incorporated
2	1.2	Todd	5/10/2006	Add reference to Section 02324 Compactor	A	Comment Incorporated
3	2.1.C	Jonny	5/10/2006	Add paragraph about conductor size and number described in contract	A	See comment 17
4	2.1.D	Todd	5/10/2006	Change "compliance" to "accordance"	A	Comment Incorporated
5	2.1	Todd	5/10/2006	Change punctuation remove periods	A	Comment Incorporated
6	3.1.E	Jonny	5/10/2006	Move paragraph to Materials section 2.1. Renumbr as necessary.	A	Comment Incorporated
7	2.2.A	Todd	5/10/2006	Reword. Use active voice	A	Comment Incorporated
8	3.1.C	Jonny	5/10/2006	Divide the section into two sentences	A	Comment Incorporated
9	3.1.G	Todd	5/10/2006	Reword. Use active voice	A	Comment Incorporated
10	3.2.A	Todd	5/10/2006	Change to "at least" and "before"	A	Comment Incorporated
11	3.3.A	Todd	5/10/2006	Spell out "ten" and use "before" instead of "prior to"	A	Comment Incorporated
12	3.3.C	Todd	5/10/2006	Reword sentence. Use active voice.	A	Comment Incorporated
13	3.3.D	Todd	5/10/2006	Change "foot" to "ft"	A	Comment Incorporated
14	3.3.D	Jonny	5/10/2006	Reference 02324 for compaction	A	Comment Incorporated
15	2.1.A	Bill Butterfield	5/22/2006	Change "regulations" to "standards"	A	Comment Incorporated
16	2.1.B	UDOT	5/22/2006	The second sentence should be its own paragraph and be indicated in th contract not SL drawings	A	Comment Incorporated
17	2.1.C	UDOT	5/22/2006	Reword to say " Conductors are to be provided as sized and numbered in the contract"	A	Comment Incorporated
18	2.1.E	UDOT	5/22/2006	Include breaker disconnects	A	Comment Incorporated
19	2.1.F	UDOT	5/22/2006	Aluminum locks are allowed. The keys should be provided only for the P848 Lock.	A	Comment Incorporated
20	2.1.G	UDOT	5/22/2006	Pole mounts only provided with approval of power provider.	A	Comment Incorporated
21	2.1.K	UDOT	5/22/2006	Conductor must be stamped with RHH-USE-RHW or XHHW	A	Comment Incorporated
22	3.1.A	UDOT	5/22/2006	Change "regulations" to "standards"	A	Comment Incorporated
23	3.1.C, 3.2.A	UDOT	5/22/2006	Check the scheduling for conflicts	A	no conflict, two different things.
24	3.1.F	UDOT	5/22/2006	Purchase hard drawn ground wires, Check NEC to see if soft draw okay	B	Sentence about hard drawing removed.
25	3.2.A	UDOT	5/22/2006	Reword to mention coordinating power service connection and confirming connection date	A	Comment Incorporated
26	3.3.A	UDOT	5/22/2006	Check AASHTO to see if wood pole is included	A	Only the wood material is, but no reference to wood pole embedment is there. Only preservatinn and dimensional recommendations are given to secondary sources. Since power company supplies these, we'll let them continue to use what they always have without being restricted by additional code. References to AASHTO sign manual will be deleted.
27	3.3.C	UDOT	5/22/2006	Ask company in Ogden about their previous wood poles. (Compacting methods) Look up wood pole and utility pole on google.	A	Company doesn't know, but compaction is fine.
28	General	Aaron B	11/20/2006	Change supplemental to blanket replacemen	A	Comment Incorporated
29	1.1	Aaron B	11/20/2006	Reword first phrase to match other specifications	A	Comment Incorporated
30	1.3.G	Aaron B	11/20/2006	NEC stands for National Electrical Code	A	Comment Incorporated
31						



**Section 13591M Traffic Monitoring Loop  
Comment Resolution Log**



**UDOT**

**Transcore**

Todd MacGillivray  
Bob Strong  
John Haigwood  
Aaron Buchanan

**Response Code Legend**

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	1.3.B	Todd	12/6/2006	Delete "National Electric Code" since it is no longer referenced with due to subsequent removals.	A	Comment Incorporated
2	3.1.A	Todd	6/12/2006	Replace "plans" with "contract"	A	Comment Incorporated
3	3.2.D	UDOT	6/19/2006	Change maximum to minimum, and add "lead-in" before "saw cuts"	A	Comment Incorporated
4	3.3.A	John	6/9/2006	Add "Follow"	A	Comment Incorporated
5	3.3.E	John	6/9/2006	Reword to say "Prevent extended exposure of"	B	Sentence removed as part of Comment 4
6	3.3.E	UDOT	6/19/2006	Remove list and put info from 1 into sentence.	A	Comment Incorporated
7	3.3.F.1	Todd	6/12/2006	SL 11 says we need 3" min cover. What do we do?	B	Changed to 3"
8	3.3.F.1	UDOT	6/12/2006	Replace "wires and homeruns" with "and lead-in wires"	A	Comment Incorporated
9	3.3.4	Bob	6/13/2006	Step 1 and step 3 should be combined into one process. Steps outlined in Section 02892, 3.6 E describes this process in better detail. The words "Depth of Cover" 1 ¼ inches leaving ¼ in from top of the pavement.	B	They are two different processes. All the important items have been incorporated.
10	3.3.F.2	UDOT	6/19/2006	add "allowing" after "saw cuts" and add "and expansion" after "curing"	A	Comment Incorporated
11	3.3.F.2	Todd	6/12/2006	Reformat fraction	A	Comment Incorporated
12	3.3.F.3	UDOT	6/19/2006	Remove mention of using sand or cement	A	Comment Incorporated
13	3.3.F.4	Bob	6/13/2006	Reference Section 02892, 2.8 B, Table 2.	B	Section 2 already refers to this section and it is a material item not an execution item.
14	3.3.I	Gerard	6/12/2006	Noone does this, it was necessary for I-15. If exiting off an asphalt shoulder you can't do this. Change this to "Concrete Pavement Exit".	A	Comment Incorporated
15	3.3.I	Todd	6/12/2006	Reformat fraction and check grammar	A	Comment Incorporated
16	3.3.I	UDOT	6/19/2006	Replace "at pavement" with "1 ft from concrete"	A	Comment Incorporated
17	3.3.J	John	6/8/2006	Change 1 to active voice	A	Comment Incorporated
18	3.3.J	Todd	6/21/2006	Delete 3 because it is already in the Junction Box Spec	A	Comment Incorporated
19	3.3.L	John	6/8/2006	Change to active voice	A	Comment Incorporated
20	3.3.L	UDOT	6/19/2006	Delete paragraph	A	Comment Incorporated
21	3.4.A	Todd	6/12/2006	Update internet reference	A	Comment Incorporated
22	3.4.A	UDOT	6/19/2006	Add "at time of bid"	A	Comment Incorporated
23	3.4.B	Todd	6/12/2006	Add "before opening the lanes of traffic"	A	See Comment 23
24	3.4.B	Bob	6/12/2006	Why are we holding up traffic until all equipment is in the cabinet. Once loops have been installed and tested for leakage and continuity traffic can be moving on the freeway. Once you have installed the epoxy sealant and it has started curing its to late.	A	Comment Incorporated
25	3.4.B	UDOT	6/19/2006	Change to "time of testing" and remove "locally"	A	Comment Incorporated
26						

**Section 13592 Roadway Weather Information System -  
Environmental Sensor Station (RWIS-ESS) and AT 15, 16, & 17  
Comment Resolution Log**



**UDOT**

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**

Todd MacGillivray  
Shelby Hansen  
Aaron Cloward  
Bob Strong

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ID #	Specification or Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	AT 15, AT 16, AT 17	Todd MacGillivray	7/14/2006	dimensions?		
2	AT 15 (A & B)	Todd MacGillivray	7/14/2006	The descriptions for the 4-inch galvanized pipe for battery cabinet do not match. These need to be the same.	A	Comment Incorporated
3	AT 15 (B)	Todd MacGillivray	8/3/2006	The length of 4-inch Schedule 40 pipe used to mount the battery cabinet needs to be changed from 10 ft. to 13 ft. 8 in.	A	Comment Incorporated
4	AT 15 (B)	Todd MacGillivray	8/3/2006	The length of electrical conductor cable to be coiled at base of pipe needs to be changed from 8 ft. to 12 ft. due to the extra length of Schedule 40 pipe described above.	A	Comment Incorporated
5	AT 15 (B)	Ralph Patterson	8/3/2006	"Install electrical conductor cable per the contract" needs to be changed to "Electrical conductor cable installed by the Department".	A	Comment Incorporated
6	AT 15 (B)	Aaron Cloward	7/14/2006	Gap between PVC and galvanized pipe?	A	Comment Incorporated, use 4 inch gap.
7	AT 15 (C)	Aaron Cloward	7/14/2006	The statement shown in Note 1 should be deleted since this needs to be verified by the Engineer prior to installation. "See Note 1" reference also needs to be deleted from Solar Panel Foundation callout. Note 1 should be replaced with the following statement shown on original drawing, "Engineer to verify that tower is accessible for service when folded over".	A	Comment Incorporated
8	AT 15 (B)	Todd MacGillivray	7/14/2006	2" conduit for electrical conductor needs to be changed from Schedule 40 to Schedule 80. This is to make this conduit more rigid without having to use GRC	A	Comment Incorporated
9	AT 15 (C)	Deryl Mayhew	8/3/2006	Delete the horizontal fence line dimension of 13' and add the total distance of 16' to match that of the vertical dimensions shown in the diagram.	A	Comment Incorporated
10	AT 16 (A)	Shelby Hansen	7/14/2006	Both references to the concrete tower base should match and they should both reference notes 6, 7, 8, and 9	A	Comment Incorporated
11	AT 16 (A & B)	Shelby Hansen	7/14/2006	All references to the tower base section should read the same.	A	Comment Incorporated
12	AT 16 (A & B)	Shelby Hansen	7/14/2006	The callouts for the conduits between the Type II PC Junction Box do not describe the size of conduit. Add 2" Conduit label to the callouts in both diagrams	A	Comment Incorporated
13	AT 16 (B)	Todd MacGillivray	7/14/2006	The 6-6-10 callout needs to be changed to 6-6-10-10 to match the shown in AT 16 (A).	A	Comment Incorporated
14	AT 16 (C)	Todd MacGillivray	7/14/2006	Change "Prior to" to "before" in the 5' conduit riser callout, in order to follow standard writing standards	A	Comment Incorporated
15	AT 16 (A)	Todd MacGillivray	7/14/2006	Darken the lines which reference the scored line in the concrete to expansion joint	A	Comment Incorporated
16	AT 16	Ralph Patterson	8/3/2006	Delete Note 11 because this statement is understood as required by all construction contracts	A	Comment Incorporated
17	AT 16	Troy Peterson	8/3/2006	Change Note 12 to Note 11 and reword.	A	Comment Incorporated
18	AT 16	Todd MacGillivray	8/3/2006	Max area for 30' pole?	F	Should be ok.
19	AT 17 (A)	Todd MacGillivray	8/3/2006	Darken ground cable lines shown in diagram.	A	Comment Incorporated
20	AT 17 (B & C)	Todd MacGillivray	8/3/2006	Increase font size of inches symbol (") to make more legible.	A	Comment Incorporated
21	AT 17	Aaron Cloward	8/3/2006	Remove Note 3 because there is no conduit that the ground wire goes in.	A	Comment Incorporated
22	AT 17	Bob Strong	8/3/2006	Add the following note to notes section: "Do not cut wire, should be continuous to each ground rod"	A	Comment Incorporated
23	AT 17	Ralph Patterson	8/3/2006	Add the following note to notes section: "Stake or flag the locations of all ground rods". This will help when the State tries to locate them later	A	Comment Incorporated
24	AT 17	Deryl Mayhew	8/3/2006	Reword Note 3 to make less confusing.	A	Comment Incorporated
25	AT 17 (B)	Shelby Hansen	8/3/2006	Add "See Note 4" to ground cable callout and add "See Note 5" to ground rod callout	A	Comment Incorporated
26	13592	Todd MacGillivray	7/27/2006	Add the following to top line of the spec., "Supplemental Specification 2005 Standard Specification Book"	A	Comment Incorporated
27	13592	Todd MacGillivray	7/27/2006	Add the following to the spec. above Part 1, "Delete Section 13592 and replace with the following:"	A	Comment Incorporated
28	13592, Section 1.1.A	Shelby Hansen	7/14/2006	Reformat paragraph and reword to follow standards writing practices.	A	Comment Incorporated
29	13592, Section 1.4	Deryl Mayhew	8/3/2006	Add Section 1.4 "Submittals" to the spec. to follow the standard specification format and move the statement from Section 3.1.C to this Section.	A	Comment Incorporated
30	13592, Section 2.1.B	Shelby Hansen, Aaron Cloward	7/31/2006	This differs from Conduit standard. Section 13553 makes no mention to detectable pull tape. Reword to reflect Conduit standard spec.	A	Comment Incorporated
31	13592, Section 2.1.C	Troy Peterson	8/3/2006	Delete original statement since this is installed by the Department replace with the following: "4-inch schedule 40 galvanized pole for solar power only"	A	Comment Incorporated
32	13592, Section 2.2.A	Deryl Mayhew	8/3/2006	Delete "Obtain proper compaction" and replace with "Compact".	A	Comment Incorporated
33	13592, Section 2.2	Deryl Mayhew	8/3/2006	Add Section 2.2.C to reference the use of the 6-6-10-10 wire mesh shown in Standard Drawing AT-16	A	Comment Incorporated
34	13592, Section 2.3.A	Deryl Mayhew	8/3/2006	Describe ground cable as being Department furnished and add ATMS Standard and NEC references. Delete installation instructions and move to Execution section (Section 3.3.A)	A	Comment Incorporated
35	13592, Section 2.3.B	Aaron Cloward	7/31/2006	Ground rod is to be furnished by the Contractor. Add ATMS Standard and NEC references. The installation instructions are detailed in the standard drawing. Delete from standard spec.	A	Comment Incorporated
36	13592, Section 2.4.A	Shelby Hansen	8/4/2006	Replace "All sensors to be" with "Furnished". All items listed in the title are furnished by the Department	A	Comment Incorporated
37	13592, Section 2.5.A	Troy Peterson	8/3/2006	Replace original statement with, "Furnish 7-foot high Type IV fence with barbed wire and arm". Include standard drawing and spec. references.	A	Comment Incorporated
38	13592, Section 3.1.B	Shelby Hansen	7/14/2006	Replace "prior to" with "before".	A	Comment Incorporated
39	13592, Section 3.1.D	Mark Parry	8/3/2006	Reword and place before State Furnished materials pick-up location (3.1.C).	A	Comment Incorporated
40	13592, Section 3.1.E	Troy Peterson	8/3/2006	Delete "unless noted otherwise".	A	Comment Incorporated
41	13592, Section 3.2	Shelby Hansen	8/4/2006	Replace "Tower" with "Service Pad", in title.	A	Comment Incorporated
42	13592, Section 3.2.A	Deryl Mayhew	8/3/2006	Replace original statement with, "Install concrete foundation and service pad. Refer to Sections 03055 and 03211"	A	Comment Incorporated
43	13592, Section 3.2.B	Deryl Mayhew	8/3/2006	Provide a reference to the ATMS standard spec. for grading.	A	Comment Incorporated

**Section 13592 Roadway Weather Information System -  
Environmental Sensor Station (RWIS-ESS) and AT 15, 16, & 17  
Comment Resolution Log**



**UDOT**

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**

Todd Mac Gillivray  
Shelby Hansen  
Aaron Cloward  
Bob Strong

**Response Code Legend**

A - Add or Correct  
B - Clarify or Evaluate  
C - Additional Information Needed  
D - Not Cost Effective / Preference  
E - Disagree  
F - Delete Comment

ID #	Specification or Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
44	13592, Section 3.2	Deryl Mayhew	8/3/2006	Delete Sections 3.2D, 3.2E, and 3.2F. Embankments should never be necessary. Also, we don't need to tell the contractor what not to do and the conduit is PVC which you don't weld. Further, F, is understood and typical practice	A	Comment Incorporated
45	13592, Section 3.3	Deryl Mayhew	8/3/2006	Make "Environmental Sensors" Section 3.4 and adjust numbering of the following sections. Replace Section 3.3 with the new section titled "Tower Grounding System"	A	Comment Incorporated
46	13592, Section 3.3	Deryl Mayhew	8/3/2006	Delete installation instructions for ground cable from Section 2.3.A reword, and insert into new Section 3.3.A	A	Comment Incorporated
47	13592, Section 3.3	Deryl Mayhew	8/3/2006	Insert new line 3.3.B for ground rod and reference standard drawing.	A	Comment Incorporated
48	13592, Section 3.4	Shelby Hansen	8/4/2006	Replace "Pavement" with "Environmental" in title. Replace original statement in 3.4.A with "Installed by the Department"	A	Comment Incorporated
49	13592, Section 3.5	Shelby Hansen	8/4/2006	Replace original title with "Remote Processing Unit (RPU)". Replace original statement in 3.5.A with "Installed by the Department"	A	Comment Incorporated
50	13592, Section 3.6	Shelby Hansen	8/4/2006	Replace original statement in 3.6.A with "Installed by the Department"	A	Comment Incorporated
51	13592, Section 3.7	Shelby Hansen	8/4/2006	Make "Fence and Gate" Section 3.8 and replace Section 3.7 with the new section titled "RWIS Tower". Insert the following statement in new Section 3.8.A, "Install tower base only. Refer to AT 16".	A	Comment Incorporated
52	13592, Section 3.8	Todd MacGillivray	8/3/2006	Replace "Furnish and install" with "Install" for Section 3.8.A and 3.8.B.	A	Comment Incorporated
53	13592, Section 3.8.B	Todd MacGillivray	8/3/2006	Add references to the standard drawings and specs.	A	Comment Incorporated
54	13592, Section 3.8.B	Shelby Hansen	7/17/2006	Replace original statement with the following: "Install fence and fence gates following the dimensions and guidelines set forth in the Department specifications"	A	Comment Incorporated
55	1.1.A.2	Mike Mauritz	12/14/2006	Why do we use the term "UDOT representative" vs "the Engineer"	A	This has been changed to "UDOT Weather Operations/RWIS Manager"
56	1.4	Mike Mauritz	12/14/2006	Bold paragraph	A	Comment Incorporated
57	3.3.A	Mike Mauritz	12/14/2006	This is inconsistent. Is the wire installed by the department or the contractor?	A	The department will install the ground wire. AT sheets and paragraph reworded
58	General	Aaron B	12/18/2006	Don't refer to specific standard drawings. Instead refer to the Series.	A	Comment Incorporated
59	AT 16	Aaron B	12/18/2006	Note 8 Is this referring to the Concrete tower Base or the state-furnished tower base section?	B	Note 8 now says "The top of the tower base section must be 9' above the concrete service pad."
60	AT 16	Aaron B	12/18/2006	Change "Concrete Tower Base" to "Concrete Tower Foundation"	A	Comment Incorporated
61	General	Aaron B	12/18/2006	Change mentions of "department furnished" to "State-Furnished"	A	Comment Incorporated

## Section 13594 Fiber Optic Communication Comment Resolution Log



**UDOT**  
Troy Peterson  
Mark Parry  
Bill Butterfield  
Robert Gibby

**Transcore**  
Todd Mac Gillvray  
Jonny Turner  
Aaron Buchanan

**Response Code Legend**  
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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	1.5.D	Todd	7/6/2006	Replace "Prior to" to "Before"	A	Comment Incorporated
2	1.5.D	Todd	7/6/2006	Consider removing, not currently asked for.	B	See note 33
3	2.2.C	Jonny	6/29/2006	Do we need to address dispersion?	B	UDOT says to remove this comment
4	2.2	Todd	7/6/2006	Include new paragraph indicating outer jacket labeling	A	Comment Incorporated
5	2.3.A	Jonny	6/30/2006	Add "Connectors" to ST and LC	A	Comment Incorporated
6	2.3.D	Jonny	6/30/2006	Replace "not acceptable" with "is not allowed"	A	Comment Incorporated
7	2.4.A 2.4.C	Todd	7/6/2006	Change "feet" to "ft"	A	Comment Incorporated
8	3.2.A	Jonny	6/30/2006	Last sentence in paragraph A should be its own paragraph.	A	Comment Incorporated
9	3.2.A	Todd	7/6/2006	Mention Contract not plans	A	Comment Incorporated
10	3.2.B	Jonny	6/30/2006	Change "72 Hours" to "3 business days"	A	Comment Incorporated
11	3.2.B	Jonny	6/30/2006	Include installation of fiber optics into ATMS sites	A	Comment Incorporated
12	3.2.D	Todd	7/6/2006	Remove "for example" and "communications"	A	Comment Incorporated
13	3.2.D.1	Jonny	6/30/2006	Add reference to 13553 for conduits and remove conduits from 13554 reference.	A	Comment Incorporated
14	3.2.H	Jonny	6/30/2006	Change "radiuses" to "Radii" and remove "short term" and "long term"	A	Comment Incorporated
15	3.2.I.1	Todd	7/6/2006	remove period after "ft"	A	Comment Incorporated
16	3.2.K	Jonny	6/30/2006	Add "butt" before "splices"	A	Comment Incorporated
17	3.2.K 3.2.L	Todd	7/6/2006	Mention Contract not plans	A	Comment Incorporated
18	3.4	Todd	7/6/2006	Change "closures" to "enclosures"	A	Comment Incorporated
19	3.5	Jonny	6/30/2006	Change "closures" to "enclosures"	A	Comment Incorporated
20	3.5.B	Jonny	6/30/2006	Change "All fiber splicing;" to "For all fiber splicing, use"	A	Comment Incorporated
21	3.5.C	Todd	7/6/2006	Move mention of manufacturer's recommendations to earlier on the paragraph	A	Comment Incorporated
22	3.6.A	Jonny	6/30/2006	Add "in every accessible location"	A	Comment Incorporated
23	3.6.A	Todd	7/6/2006	Add "e.g"	A	Comment Incorporated
24	3.7.A	Jonny	6/30/2006	Change "72 Hours" to "3 business days"	A	Changed to five per 13551.
25	3.7.A	Todd	7/6/2006	Replace "Prior to" to "Before"	A	Comment Incorporated
26	3.7.D.7	Jonny	6/30/2006	Change "refraction" to "refractive"	A	Comment Incorporated
27	3.7.D.11	Todd	7/6/2006	Add "inch" to dimensions	A	Comment Incorporated
28	3.7.E.1	Jonny	6/30/2006	Replace ", one strand per buffer tube. Test every strand when evidence of physical damage exists or when any damaged strand is found." with "all strands"	A	Comment Incorporated
29	3.7.E.9	Jonny	6/30/2006	Add that test reports must be submitted and approved before installation	A	Comment Incorporated
30	3.7.F	Jonny	6/30/2006	Change "blowing/pulling" to "installation"	A	Comment Incorporated
31	3.7.G	Todd	7/6/2006	Mention Contract not plans	A	Comment Incorporated
32	1.5.D	UDOT	7/13/2006	Remove paragraph	A	Comment Incorporated
33	1.5.E 1.5.F	UDOT	7/13/2006	Combine paragraphs with cert first	A	Comment Incorporated
34	1.5.G	UDOT	7/13/2006	Reword second sentence to say "Obtain test form from..."	A	Comment Incorporated
35	2.2.F	UDOT	7/13/2006	Have label say UDOT not Utah Department of Transportation	A	Comment Incorporated
36	2.3.A.2	UDOT	7/13/2006	Include "pre-polished". Remove "LC compatible"	A	Comment Incorporated
37	2.3.D	UDOT	7/13/2006	Remove	A	Comment Incorporated
38	2.4.B 2.4.C	UDOT	7/13/2006	Make more generic. Make sure that it will hold enough splices, what kind of splices and how many cables	B	The previous supplemental shows much less detail. Do more details need to be added? See comment 44.
39	2.5.A	UDOT	7/13/2006	Remove "three section"	A	Comment Incorporated
40	3.2.B	UDOT	7/13/2006	Make schedule consistent with section 13551	B	Nothing in 13551 that discusses this notification.
41	3.2.J	UDOT	7/13/2006	Change "butt" to "full"	A	Comment Incorporated
42	3.4	UDOT	7/13/2006	Reword and combine paragraphs	A	Comment Incorporated
43	3.7.E	UDOT	7/13/2006	Remove paragraph	A	Comment Incorporated
44	General	Aaron	10/30/2006	The changes to the 2005 Standard expressed in the August 25th Supplemental Spec are not added to this document. Was this intentional or an oversight?	A	Changes in supplemental are incorporated
45	2.3.C	Aaron	11/2/2006	Remove "in order"	A	Comment Incorporated
46	2.3.A	Aaron	11/2/2006	Replace "on the plans" with "in the contract"	A	Comment Incorporated
47	1.1.A	Aaron	11/2/2006	Instead of "furnish, install, and test" put "materials and procedures for installing and testing"	A	Comment Incorporated
48	1.2.1.3	Aaron	11/2/2006	Switch the titles for 1.2 and 1.3	A	Comment Incorporated

**Section 13594 Fiber Optic Communication  
Comment Resolution Log**



<b>UDOT</b>	<b>Transcore</b>
Troy Peterson	Todd Mac Gillvray
Mark Parry	Jonny Turner
Bill Butterfield	Aaron Buchanan
Robert Gibby	

**Response Code Legend**

- A** - Add or Correct
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- E** - Disagree
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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
49	2.2.A	Aaron	12/18/2006	Remove first sentence. This is already part of the submittal processs	A	Comment Incorporated
50						

**Section 13595 ATMS Integration  
Comment Resolution Log**



**UDOT**

Troy Torgerson  
Deryl Mayhew  
Mark Parry  
Bill Butterfield

**Transcore**

Todd Mac Gillvray  
Jonny Turner  
Aaron Cloward  
Gerard Kies  
Bob Strong

**Response Code Legend**

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	All	Todd	5/10/2006	Change all passages referring to "the plans" or "specs" or "details" to the "contract".	A	Agreed.
2	1.1.C	Deryl	5/22/2006	Add the materials necessary to complete and test the device integration.	A	Added "Furnish all necessary test materials and cables and connectors to complete and test the integration of the ATMS device."
3	1.2.A	Jonny T.	5/10/2006	Could this whole section be included in section 13551 part 3.17?	F	Not without great difficulty. We rarely want to have the contractor perform "integration", but if we do we need to set the rules.
4	1.3.B, all	Bill B.	5/22/2006	Match the title of the form used online.	A	Since we're changing these and not the forms, we'll use "30 Day" and not "Thirty Day" per your request.
5	3.1.A	Todd	5/10/2006	Reword to say "integration" not "Integration Task"	A	done
6	3.1.A	Bill B.	5/22/2006	Incorporate changes consistent with the "General ATMS" spec.	A	done
7	3.1.B, 3.1.D	Todd	5/10/2006	Use more appropriate web address, <a href="http://www.dot.utah.gov/index.php?m=c&amp;tid=332">http://www.dot.utah.gov/index.php?m=c&amp;tid=332</a>	A	Done
8	3.1.C	Todd	5/10/2006	Use the serial comma and consider moving this into Part 1.	A	Done, this was relocated becoming 1.1.C. Relettering was performed accordingly.
9	3.1.D	Todd	5/10/2006	Add "in writing" after "Engineer", replace "in advance of" to "before", replace "upon which" with "that", replace "witnesses" with "will witness", and replace "designatees" with "designate".	A	Done.
10	3.1.E	Todd	5/10/2006	Add "ATMS" after "Day".	A	Done
11	3.1.F	Todd	5/10/2006	Add ", in coordination with Traffic Operations Center (TOC) staff, " after "Operate the device", add "ATMS" after "Day" and not after "Burn-in" to properly label the test name, and delete F.1. Delete number 2 and incorporate information into one paragraph. Change "Traffic Operations Center" to "Department" after its first usage.	A	Done
12	3.1.F	Bill B.	5/22/2006	Check testing and see if we can say "scheduled" instead of "daily".	F	We can't.
13	3.1.G	Todd	5/10/2006	Replace "of Contractor furnished" with "due to".	A	done
14	3.1.G.2	Todd	5/10/2006	Add "(from day one)" and delete "re starts" as shown.	A	done
15	3.1.G.2	Mark	5/22/2006	Indent "device".	A	done
16	3.1.G.3	Todd	5/10/2006	Incorporate 3.a. into 3 by adding a new sentence starting with "If defects are identified, cover the costs required to remedy the defect." This clarifies the Contractor's requirement more than the current spec.	A	done
17	3.1.H	Todd	5/10/2006	Delete this section, this requirement is already covered in the spec.	A	done
18	All	Todd	5/10/2006	Reletter as necessary, ending with 3.1.G.	A	done
19						

**AT Sheets 2-5**  
**Comment Resolution Log**



**UDOT**

Mark Parry  
Troy Peterson

**Transcore**

John Haigwood  
Todd MacGillivray  
Aaron Buchanan

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	AT 2	John H.	6/12/2006	Add "Typ" to the mast arm minimum of 12'	A	Comment Incorporated
2	AT 2	John H.	6/12/2006	Match reference to A and B of AT 3B on the three light mast arm to two light mast arm	A	Comment Incorporated
3	AT 2	Todd M.	6/12/2006	Change "travelway" to "traveled way" in note 6	A	Comment Incorporated
4	AT 2	Todd M.	6/12/2006	Change "note" to "notes"	A	Comment Incorporated
5	AT 2	John H.	6/12/2006	Add see note 1 to side signal head symbol	A	Comment Incorporated
6	AT 2	Todd M.	6/12/2006	Move "only" to after "head" in note 1	A	Comment Incorporated
7	AT 2	Todd M.	6/12/2006	Add note 3 "Place poles on breakaway base. Locate per MUTCD"	A	Comment Incorporated
8	AT 2	John H.	6/12/2006	Change reference of sign from D of AT 3 to B of AT 3A	A	Comment Incorporated
9	AT 2	John H.	6/12/2006	Change reference of sign from A of AT 3 to A of AT 3A	A	Comment Incorporated
10	AT 2	Todd M.	6/12/2006	Add note to C "1. Place pole on breakaway base. Locate per MUTCD"	A	Comment Incorporated
11	AT 2	Aaron B.	12/4/2006	Check height of signal head with MUTCD	B	MUTCD 4H.02 specifies that the height from the top of the pavement grade at the center of the roadway to the bottom of the signal head housing of the lowest signal face should be between 4.5 feet to 6 feet. Changed the profile to have the 4.5' min to 6' max measured from the top of the roadway surface. Also removed the 6' dimension.
12	AT 3	Todd M.	6/12/2006	Create 3A and 3B to accommodate the new "2 vehicles" signs, and provide new lettering layout. Update other AT sheets to properly reference new 3A and 3B drawings.	A	done
13	AT 3A	Todd M.	6/12/2006	Invert 5" R	A	Comment Incorporated
14	AT 3B	Todd M.	6/12/2006	Move "vehicles" to the left to match right line	A	Comment Incorporated
15	AT 3B	John H.	6/12/2006	Change "1 vehicle" to "2 vehicles" for B and D	A	Comment Incorporated
16	AT 4	Todd M./Bob S.	6/12/2006	Add note 21 "Visor - 8" and 12"	A	Comment Incorporated
17	AT 4	Todd M.	6/12/2006	Remove note 1 and move "only" to after "head"	A	Comment Incorporated
18	AT 5	John H.	6/12/2006	Renumber notes 2-5 to 3-6 and add note 2 "Place junction boxes per AT 7. Refer to SL11 and SL 12 for detection.	A	Comment Incorporated
19	AT 5	Todd M./Mark Parry	6/21/2006	Add note 7 "Place cabinet on either side of traffic	A	Comment Incorporated
20	AT 5	Todd M.	6/12/2006	Change "travelway" to "traveled way" in note 6	A	Comment Incorporated
21	AT 5	Todd M.	6/12/2006	Remove "asphalt concrete" from note 3	A	Comment Incorporated
22	AT 5	Todd M.	6/12/2006	Note 4, change "all loops" to "each loop"	A	Comment Incorporated
23	AT 5	Bill B.	6/19/2006	Check SL 10	B	Neither shows info about splicing. SL 10 is only when there is a junction box directly next to a cabinet. SL 11 looks correct, but we may want to also reference SL 12 in future.
24	AT 5	Mark Parry	6/19/2006	Make sure "tag" is defined in the Specs	B	3.3.D in Section 13591 mentions but does not define it.
25	AT 2	Todd M.	6/12/2006	Remove period from Typ.	A	Comment Incorporated
26	AT 2	Todd M.	6/12/2006	Change "regional" to "region" in note 2	A	Comment Incorporated
27	AT 3B	Mark Parry	6/19/2006	Replace "Traffic Signal Coordination Engineer" with Region Traffic Engineer	A	Comment Incorporated
28	AT 3B	Todd M.	6/21/2006	Add to revision box "2 06/21/06 TJM Added "2" Vehicles per green signs"	A	Comment Incorporated
29	AT 3A	Todd M.	6/21/2006	Add side line to dimension	A	Comment Incorporated
30	AT 5	Todd M.	6/21/2006	Add to revision box "2 06/21/06 TJM Added and revised notes"	A	Comment Incorporated
31	AT 4	Todd M.	6/21/2006	Add to revision box "2 06/21/06 TJM Added visor and deleted powder note"	A	Comment Incorporated
32	AT 2	Todd M.	6/21/2006	Add to revision box "3 06/21/06 TJM Added and revised notes"	A	Comment Incorporated
33						

**Standard Drawing AT 18**  
**Comment Resolution Log**



UDOT

Transcore

Todd Mac Gillvray  
 Aaron Buchanan

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	AT 18	John H.	6/12/2006	Add note 4: "If combined with ramp metering, only same direction of travel may be combined"	A	Also added that separate ATMS Coabinets will need to be used for different sides of traffic.
2	AT 18	Todd	6/12/2006	Add revision note "2 6/23/06 TJM Added Lane 6"	A	Comment Incorporated
3	AT 18	Todd	6/12/2006	Add a lane 6 and renumber stations	A	Comment Incorporated
4	AT 18	Todd	6/12/2006	Use bigger fonts for notes similar to other standards	A	Comment Incorporated
5	AT 18	UDOT	6/19/2006	When would Note 1 be needed? Ramp meters?	A	yes, ramp meters.
6	AT 18	UDOT	6/19/2006	Will it function in controller this way?	A	sure
7	AT 18	UDOT	6/19/2006	Home runs, cabinet location, NID. Should we show distances?	F	no, let the designer choose.
8						



# Final UDOT Comment Resolution Log



**UDOT**  
Erik Brondum  
Clark Mackay

**Transcore**  
Todd Mac Gillvray  
Aaron Buchanan

## Response Code Legend

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ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
1	AT 2	Erik	1/17/2007	Fix pavement and ground hatching on B and C	A	Comment Incorporated
2	AT 4	Clark Mackay	1/3/2007	Note #7 change 'galvannized' to 'galvanized'	A	Comment Incorporated
3	AT 5	Erik	1/17/2007	Change text "OFFSET SEE NOTE 5" to "OFFSET SEE NOTE 6" on B and C	A	Comment Incorporated
4	AT 6	Erik	1/17/2007	Add ground hatching	E	It's ok because it might be under pavement. We haven't had a problem here.
5	AT 9	Erik	1/17/2007	Should B have a "VARIES SEE NOTE 4" call out?	A	Comment Incorporated
6	AT 9	Clark Mackay	1/3/2007	Add 'Section' in front of 13553 in note 4	A	Comment Incorporated
7	AT 16	Clark Mackay	1/3/2007	In Detail C change 'pouring concrete' to 'placing concrete'	A	Comment Incorporated
8	13551					
9	1.2.C	Clark Mackay	1/3/2007	This has too many spaces.	E	Look at the final version not showing markup.
10	1.2.I	Erik	1/17/2007	This should be 13595	A	Comment Incorporated
11	2.1.2	Erik	1/17/2007	I am in the process of resolving this	A	Already taken care of
12	Table 1	Erik	1/17/2007	Should we insert a title to be consistent with other table?	A	Added title "Submittal Requirements"
13	Table 1	Erik	1/17/2007	Bold column descriptions	A	Comment Incorporated
14	3.2.A	Erik	1/17/2007	Remove parantheses	A	Comment Incorporated
15	3.3.C	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
16	3.5.F	Clark Mackay	1/3/2007	This has too many spaces.	E	Look at the final version not showing markup.
17	3.7.C	Erik	1/17/2007	Change all caps to lower case in quotes	E	Conforming to MUTCD usage.
18	3.8.A	Clark Mackay	1/3/2007	This has too many spaces.	E	Look at the final version not showing markup.
19	3.1	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
20	3.11.B.1	Clark Mackay	1/3/2007	Contact the engineer at least 48 hours prior to WHAT?	A	Before removal
21	13552					
22	General	Clark Mackay	1/3/2007	This section has 6 pages not 5.	E	Nope it only has 5 pages. Look at the final without markups
23	2.2.D, 2.3.B	Erik	1/17/2007	Change all caps to lower case in quotes	E	Conforming to MUTCD usage.
24	2.4.B	Erik	1/17/2007	Add MUTCD	A	Comment Incorporated
25	General	Erik	1/17/2007	Make capitalization of "Series" consistent throughout	A	Comment Incorporated
26	3.2.A	Erik	1/17/2007	Remove apostrophe "s"	A	Comment Incorporated
27	3.2.E.2	Clark Mackay	1/3/2007	This has too many spaces.	E	Look at the final version not showing markup.
28	3.8.B	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
29	3.8.B	Erik	1/17/2007	Reword "recommended manufacturer's"	A	Comment Incorporated
30	13553					
31	2.1.B	Erik	1/17/2007	Use words for quantities and add hyphen	A	Comment Incorporated
32	2.1.C	Erik	1/17/2007	Add comma after "plugs"	A	Comment Incorporated
33	2.1.D	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
34	2.1.E	Erik	1/17/2007	Remove space between whole and fraction, and add "and". Make consistent throughout.	A	Comment Incorporated
35	3.2.A	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
36	3.2.B	Erik	1/17/2007	Add "to"	A	Comment Incorporated
37	3.2.C	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
38	3.2.F.2	Erik	1/17/2007	Add "as"	A	Comment Incorporated
39	3.2.H	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
40	3.2.H.1	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
41	3.2.L	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
42	3.3.D	Erik	1/17/2007	Change "to ensure" to "so"	A	Comment Incorporated
43	3.3.D	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
44	3.3.F	Erik	1/17/2007	Add "the" after "into"	A	Comment Incorporated
45	3.3.H	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
46	3.5.C	Clark Mackay	1/3/2007	Too many spaces between contract and period	E	Look at the final version not showing markup.
47	3.6.A	Erik	1/17/2007	Add "and" before "textured"	A	Comment Incorporated
48	13554					
49	2.5.A	Erik	1/17/2007	Fix fraction format	A	Comment Incorporated
50	3.2.D	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
51	3.2.I	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
52	3.2.J	Erik	1/17/2007	Add hyphen. Make consistent throughout	A	Comment Incorporated
53	3.2.J	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
54	13555					
55	3.1	Clark Mackay	1/3/2007	Why do you want to restore the area to original condition before beginning work. Don't you want to restore to original condition after ending work?	A	Paragraph reworted.
56	3.4	Erik	1/17/2007	Change to "Install Disconnect, Transformer, or Both"	a	Comment Incorporated
57	General	Clark Mackay	1/3/2007	You use both aboveground and above ground. Both are correct but maybe you should pick one style. See F and H4. H3 appears to have too many spaces	A	Changed to "above ground" in all cases. No extra spaces found.
58	13592					

**Final UDOT  
Comment Resolution Log**



<u>UDOT</u>	<u>Transcore</u>
Erik Brondum	Todd Mac Gillvray
Clark Mackay	Aaron Buchanan

**Response Code Legend**

- A - Add or Correct
- B - Clarify or Evaluate
- C - Additional Information Needed
- D - Not Cost Effective / Preference
- E - Disagree
- F - Delete Comment

ID #	Sheet #	Comment made by:	Comment Date	Comment	Response Code	Response
59	3.2.D	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
60	13594					
61	1.5.B	Clark Mackay	1/3/2007	Start the sentence with 'Provide	A	Comment Incorporated
62	1.5.D	Clark Mackay	1/3/2007	Indented too far	E	Look at the final version not showing markup.
63	3.7.D.15	Erik	1/17/2007	Remove space between whole and fraction	A	Comment Incorporated
64						

## Standards Committee Submittal Sheet

Name of preparer: Degen Lewis  
Title/Position of preparer: Concrete Engineer  
Specification/Drawing/Item Title: Pavement Marking Paint  
Specification/Drawing Number: 02765

**Enter appropriate priority level:**

(See last page for explanation) 3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

**NOTES:**

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

Maintenance and Construction have been using different specifications for the purchase of paint and beads. The result has been striping of unacceptably poor quality from newly constructed projects as compared with work done by Maintenance. The difference in specifications also requires more switching of product by contractors in order to meet the varying specifications.

Additionally, the new specification alters the use of black out paint for short duration removal needs. The methods of removal are restricted for the final surfacing layer. Both situations need prior approval from the District Engineer before deviations from the standard are allowed, but some deviation is now possible.

Directions to the Engineer for purposes of sampling have been removed and placed in the Materials Manual of Instruction where they should be. The Minimum Sampling and Testing Guide has been updated to indicate need for timely submittal of samples.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

There are no changes required to the M&P.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item. Emailed to both on January 11, 2007

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

None received.

ACEC Comments: (Use as much space as necessary.)

1. In 1.3.E calibration tolerances are discussed. We are somewhat unfamiliar with the specific equipment used, but it appears that the +/- 0.5 pounds per gallon refers to a meter for the glass beads. Is there also a calibration tolerance for paint application?

The units will be reviewed and changed as needed.

2. Is 1.3.F intended to require the contractor to coordinate with the engineer to perform the inspection and verifications? Could it be worded as such?

It is intended to indicate what and how the contractor can expect the Engineer to check for acceptance.

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Changes to the paint specification have been reviewed and commented on by the Region Materials Engineers (RME) as part of the monthly RME meetings. It has also been reviewed and commented on by a pavement marking QIT with the following members:

- 1) Doug Bassett, Region Three Traffic & Safety
- 2) Rich Clarke, Central Maintenance
- 3) Rob Clayton, Central Traffic & Safety
- 4) Bill Gooch, Region One Project Management
- 5) Brent Hadfield, Central Materials
- 6) Shana Lindsey, Engineer for Research
- 7) Vincent Liu, Central Maintenance
- 8) Robert Stewart, Region Two Construction

Also emailed to the Preconstruction, Traffic & Safety, Project Management, & Construction/Maintenance Groups in each Region on January 11, 2007.

Received the following from Brian Phillips in Region Three:

- 1) 1.3.E – Who is the “UDOT Equipment Certification Unit?” How do they find them?

Reference no longer applies and has been removed.

- 2) Add “at not cost to UDOT” to the reject pay factor in tables 1, 2, & 3.

Changed reject pay factor to “0.00 \*” with the asterisk noted below table three with the following note “Repaint pavement markings at no cost to UDOT.”

- 3) Does the bead gradation (2.3.A.1) meet the proposed gradation written by Central Maintenance?

No it does not. It is the same as the previous specification. This is deliberate since Maintenance needs to experiment with this new gradation and the associated costs before it is added to the standard specification. Maintenance plans to have this information by early summer so the spec may see this one additional modification prior to the final 2008 deadline.

Construction Engineers

Contractors (Any additional contacts beyond “C” above.)

## Suppliers

Proposed specification was emailed to both Ennis Paint and Pervo Paint. Comments received were incorporated into the final version. Final version emailed again to both on January 17, 2007. No further comments received.

Consultants (as required) (Any additional contacts beyond “C” above.)

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

Emailed on January 11, 2007. Received the following comments from Roland Stanger:

- 1) Suggested consistency change to “legend” instead of interchangeable use of “message” or “symbol” with the first use of legend defined as message or symbol.

Changes made as outlined.

- 2) Suggested adding a column for “blue” paint to table four. Apparently dedicated ADA parking stalls will soon be “required” on city streets.

Have not added the “blue” column. Would need to confer with others in the Department about this new requirement. Suggest that if such markings are necessary that the Department consider doing them in some material other than pavement marking paint (i.e. preformed thermoplastic, tape, etc). At this point probably best left to modification by Special Provision when needed.

- 3) Suggested general rewording of 3.4.B.1.

Sub-paragraph reworded as suggested.

Others (as appropriate)

- E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

None.

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

None.

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

None required.

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.

None anticipated. Paint manufacturers have been meeting these requirements through Maintenance Procurement Contracts. Penalty factors incorporated based on input from manufacturers.

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).

None anticipated. New material does not require any new equipment or methods.

3. Life cycle cost.

Maintenances experience has been that the paint they are applying is lasting noticeably longer than that applied in construction projects. The life cycle cost may not be less since weather prevents application of paint when needed (i.e. we paint once a year during the summer.

G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

Paint applied through construction projects should last longer than previously. Now that the maintenance and construction specifications match contractors should have fewer issues moving between types of work.

H. Safety Impacts?

Greater durability will improve lane guidance available to motorists.

I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

None.

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

- |            |   |
|------------|---|
| Priority 1 | Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised. |
| Priority 2 | Upon posting, this impacts projects being advertised.   |
| Priority 3 | Upon posting, the approved standard takes effect <b>four weeks</b> later for projects being advertised.   |



**Supplemental Specification  
2005 Standard Specification Book**

**SECTION 02765**

**PAVEMENT MARKING PAINT**

**Delete Section 02765 in its entirety and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Furnish Acrylic Water Based pavement marking ~~paint meeting Federal Specification TTP-1952-D and refer~~ paint. Refer to 2.2 for resin requirement.
- B.      Apply to hot mix asphalt or Portland cement as edge lines, center lines, broken lines, guidelines, contrast lines, symbols, and other related markings.
- C.      Remove pavement markings.

**1.2      REFERENCES**

- A.      ~~A.~~—~~A~~ASHTO M 247: Standard Specification for Glass Beads Used in Traffic Paints
- B.      ~~B.~~—~~ASTM D 562~~: ASTM D 562: Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using ~~the~~ a Stormer-Type Viscometer
- C.      ~~C.~~—ASTM D 2205: Standard Guide for Selection of Tests for Traffic Paints
- D.      ~~D.~~—ASTM D 2743: Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography
- E.      ~~E.~~—ASTM D 2805: Standard Test Method for Hiding Power of Paints by Reflectometry
- F.      ~~F.~~—ASTM D 3723: Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing

- G. ~~G.~~—ASTM D 3960: ASTM D 3960: Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- H. ~~H.~~—ASTM D 4451: Standard Test Method for Pigment Content of Paints by Low-Temperature Ashing
- I. ~~I.~~—ASTM D 5381: Standard Guide for X-Ray Fluorescence (XRF) Spectroscopy of Pigments and Extenders
- J. ~~J.~~—ASTM E 1347: Standard Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry
- K. ~~K.~~—Federal Standards
- L. Manual on Uniform Traffic Control Devices (MUTCD)

### 1.3 ACCEPTANCE

- A. Provide documentation of the manufacturer and production batch identification for the paint used.
- B. ~~A.~~—Provide fixtures (ball valves, gate valves or other) on paint truck for the purposes of obtaining field samples.
- C. ~~B.~~—Agitate the paint to allow for thorough mixing. Follow paint ~~manufacturer's~~manufacturer's recommendation for agitation and mixing times.
- D. ~~C.~~—Stop all agitation before sample is drawn.
- ~~E.D.~~—Calibrate ~~All~~ meters on the paint truck ~~must be calibrated~~ annually and certified for application rate verification.
  - 1. Use ~~C~~ calibration tolerances for meters ~~of must be~~ +/- ± 0.5 pounds per gallon.
  - 2. Keep a clean, legible copy of calibration report with the paint truck. Certifications performed by company ~~personnel~~personnel or meter calibration ~~companies.~~ companies or UDOT Equipment Certification Unit.
- ~~E.~~—UDOT ENGINEER:—
  - ~~1. Visually inspects each line to verify bead adhesion and compliance with specified line dimensions requirements.~~
  - ~~2. Verifies that the paint and beads are being applied within specified tolerances a minimum of once each production day.~~
  - 3. Verifies quantities used by either method:companies.
- F. The Engineer will:

1. Visually inspect lines and legends (symbols and messages) to verify compliance with the required dimensions.
2. Inspect at a minimum at the end of each production day.
3. Verify quantities applied by either of the following methods:
  - a. ~~a.~~ Measuring both paint and bead tanks prior to and after application.
  - b. ~~b.~~ Witnessing the meter readings prior to and after application.
4. ~~Randomly sample each color of pavement marking paint used, minimum of one sample each per project.~~
  - a. ~~Use a clean one pint metal paint can.~~
  - b. ~~Sample paint immediately after the paint has been completely agitated. (Stop all agitation before drawing the sample)~~
  - c. ~~Allow a minimum of 10 gallons to be applied prior to taking sample.~~
  - d. ~~Fill the sample container to within 1/2 inch of full.~~
  - e. ~~Seal the containers immediately by tightly attaching the container's lid.~~
  - f. ~~Submit paint samples to Central Chemistry Lab for acceptance.~~
  - g. ~~For each sample include:~~
    - ~~Project Number~~
    - ~~Project Name~~
    - ~~Paint Manufacturer~~
    - ~~Batch Number~~
    - ~~Striping Company~~
    - ~~Color of Paint~~
    - ~~Est. Quantity~~
    - ~~Date Sampled~~
    - ~~Sampler's name~~

~~F.~~ Repaint any line or symbol/legend failing to meet bead adherence and dimensional requirements.

G. ~~requirements.~~

H. Price Reductions. When more than one of the requirements of the pavement markings is deficient, the result with the highest price reduction governs.

G.1. Price Reductions for Pavement Markings ~~reductions for pavement markings~~ installed below the specified wet mil thickness are outlined in Table 14.

**Table 1**

<b>Table I-- Price Reduction for Wet Mil Thickness</b>	
<b>Table I-- Price Reduction for Wet Mil Thickness</b>	
	Pay Factor
At the specified mil thickness	1.00
1-10 percent below the Specified wet mil thickness	0.75
11-15 percent below the Specified wet mil thickness	0.50
More than 15 percent below the Specified wet mil thickness	Repaint Pavement Markings
More than 15 percent below the Specified wet mil thickness	0.00 *

2. Price reductions for pavement markings installed below the specified total solids, pigment, and non-volatile vehicle content (shown in table IV) are outlined in Table 2H.

**Table 2**

<b>Table H-- Price Reduction for Total Solids, Pigment and Non-Volatile Vehicle</b>	
	Pay Factor
At or above the specified percentage	1.00
Up to 0.5 percent below the specified percentage	0.85
0.5 to 1.0 percent below the specified percentage	0.70
More than 1.0 percent below the specified percentage	0.00 *

3. H.——Price reductions for pavement markings that fail to meet the remaining requirements of Table 4HHV are outlined in Table 3. H. When more than one of the requirements of Table III are deficient. The result with the highest price reduction governs.HH.

**Table 3**

<b>Table H-- Price Reductions</b>	
<b>Table III-- Price Reductions</b>	
	Pay Factor
At the specified requirements	1.00
Up to 1 percent deficient	0.90
Up to 2 percent deficient	0.80
1 to 2 percent deficient	0.80
Up to 3 percent deficient	0.70
2 to 3 percent deficient	0.70
Up to 4 percent deficient	0.60

<u>3 to 4 percent deficient</u>	<u>0.60</u>
<u>Up to 5 percent deficient</u>	<u>0.50</u>
<u>4 to 5 percent deficient</u>	<u>0.50</u>
<u>More than 5 percent below specified quantitative requirements</u>	Repaint Pavement Markings
<u>More than 5 percent below specified quantitative requirements</u>	<u>0.00 *</u>

\* Repaint pavement markings at no cost to UDOT.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. ~~Select an acrylic water based pavement marking paint manufacturer, from Products that have conformed to this specification may be found on~~ Refer to the Accepted Products Listing (APL) maintained by the UDOT Research Division for products that conform to this Section as needed.

### 2.2 PAINT

- A. ~~Follow Federal Standards 595B, 37875, 33538, and 11105. Meet the following~~ Meet the requirements for Acrylic Water Based Paint as listed in Table ~~III:IV:~~

**Table 4**

<b><u>Table III--Paint Requirements</u></b>				
<b><u>Table IV--Paint Requirements</u></b>				
Property	White	Yellow (lead free)	Black	Test
<u>Property</u>	<u>White</u>	<u>Yellow</u>	<u>Black</u>	<u>Test</u>
<del>Pigment: Percent by weight</del>	<u>62.0</u>	<u>62.0</u>	<u>62.0</u>	<u>ASTM D 3723</u>
<u>Pigment: Percent by weight</u>	<u>63.0</u>	<u>63.0</u>	<u>63.0</u>	<u>ASTM D 3723</u>
<del>Total Solids: Percent by weight, minimum</del>	<u>77.0</u>	<u>77.0</u>	<u>77.0</u>	<u>ASTM D 2205</u>
<u>Total Solids: Percent by weight, minimum</u>	<u>79.0</u>	<u>79.0</u>	<u>79.0</u>	<u>ASTM D 2205</u>

<del>Nonvolatile vehicle:</del> <del>Percent by weight</del> <del>vehicle, minimum*</del>	<del>40.0</del>	<del>40.0</del>	<del>40.0</del>	<del>ASTM D 2205</del>
<u>Nonvolatile vehicle:</u> <u>Percent by weight</u> <u>vehicle, minimum*</u>	<u>43.0</u>	<u>43.0</u>	<u>43.0</u>	<u>ASTM D 2205</u>
<del>Viscosity, KU @ 77</del> <del>degrees F</del>	<del>80—95</del>	<del>80—95</del>	<del>80—95</del>	<del>ASTM D 562</del>
<u>Viscosity, KU @ 77</u> <u>degrees F</u>	<u>80 - 95</u>	<u>80 - 95</u>	<u>80 - 95</u>	<u>ASTM D 562</u>
<u>Density, lbs/gal</u>	<u>14.1 ± 0.3</u>	<u>14.1 ± 0.3</u>	<u>14.1 ± 0.3</u>	<u>ASTM D 2205</u>
Volatile Organic Content (VOC): lbs/gal, maximum	1.25	1.25	1.25	ASTM D 3960
Titanium Dioxide Content, lbs/gal	1.0 min	0.2 max	N/A	ASTM D 5381
<u>Color Definition</u>	<u>37875</u>	<u>33538</u>	<u>N/A</u>	<u>Federal Standard 595B</u>
<del>Directional Reflectance:</del> <del>Minimum</del>	<del>92.0</del>	<del>50.0</del>	<del>N/A</del>	<del>ASTM E 1347</del>
<u>Directional Reflectance:</u> <u>Minimum</u>	<u>90.0</u>	<u>50.0</u>	<u>N/A</u>	<u>ASTM E 1347</u>
Dry Opacity: Minimum (5 mils wet)	0.95	0.95	N/A	ASTM D 2805

\* ~~The binder: shall be~~ 100 percent ~~acrylic, a minimum of 40 percent, acrylic cross-linking polymer,~~ by weight, as determined by infrared analysis and other chemical analysis available to UDOT (ASTM D 2205). ~~Consisting of either Rohm and Haas Fastrack HD 21A or Dow DT 400NA.~~

#### B. No-Pick-Up Time

1. Paint may not smear or track three minutes after application to the roadway using standard application equipment, at the mil thickness required, and with an ambient shaded temperature of at least 50 degrees F.

#### B.C. Additional requirements:

- Free of lead, chromium, or other related heavy metals ASTM D 5381.
- ASTM D 2743, ASTM D 4451 and ASTM D 5381: Tests used to verify paint samples meet Accepted Products Listing.

### **2.3 GLASS SPHERES (BEADS) USED IN PAVEMENT MARKING PAINT**

#### **A. Specific Properties: Meet AASHTO M 247 with the following exceptions.**

- Gradation:**

Passing a No. 14 sieve, percent	95 - 100
Passing a No. 16 sieve, percent	80 - 95
Passing a No. 18 sieve, percent	10 - 40
Passing a No. 20 sieve, percent	0 - 5
Passing a No. 25 sieve, percent	0 - 2

2. Beads: ~~havings~~shall have a Silane adhesion coating.
3. Roundness - The glass beads will have a minimum of 80 percent true spheres.

- B. Beads used in Temporary Pavement Markings meet the above or AASHTO M 247 Type II uniform gradation.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Line Control.
  1. Establish control points at 100 ft intervals on tangent and at 50 ft intervals on curves.
  2. Maintain the line within 2 inches of the established control points and mark the roadway between control points as needed.
    - a. Remove paint that is not placed within tolerance of the established control points and replace at no expense to the Department. Refer to this Section, article 3.4.
    - b. Maintain the line dimension within 10 percent of the width and length dimensions defined in Standard Drawings.
- B. Remove dirt, loose aggregate and other foreign material and follow manufacturer's recommendations for surface preparation.

### 3.2 APPLICATION

- A. Apply Pavement marking paint at the following Wetwet mil thickness requirements.

1. 201. 20 – 25 wet mils for all longitudinal markings.

**Example Calculation:** (Verify wet mil thickness)

$$\text{Wet Mils} = \frac{(0.133681 \text{ ft}^3/\text{gal}) * 12000 \text{ mil/ft}}{(X \text{ ft/gal})(Z \text{ ft})}$$

Where,

X = application rate. (Meter readings or dipping tanks).

Z = line width measured in feet.

12000 = conversion from ft to mil  
0.133681 = conversion from gallons to cubic feet.

**For information only:** Approximate application rate for required mil thickness requirements.

- ~~1.~~ a. 4 inch Solid Line: From 190 to 240 ft/gal
- ~~2.~~ b. 4 inch Broken Line: From 760 to 960 ft/gal
- ~~3.~~ c. 8 inch Solid Line: From 95 to 120 ft/gal

2. 23 – 40 wet mils for all painted legends as determined by a wet mill gauge.

~~B.C.~~ Refer to Table 1I for pavement markings that are less than ~~20~~required wet mils in thickness.

~~C.D.~~ No additional payment for pavement markings placed in excess of ~~25~~required wet mils in thickness or exceeding dimensional requirements outlined in this Section, Article 3.1 paragraph A.

~~D.~~ Painted Legends and Symbols 1-gallon per 80 square feet. Provide Engineer calculations of legends and symbols for pay determination.

E. Glass Sphere (Beads): Apply a minimum of 8 lbs/gal of paint, the full length and width of line and pavement markings.

- 1. Do not apply glass beads to contrast lines (black paint).

F. Begin striping operations no later than 24 hours after ordered by the Engineer.

G. At time of application apply lines and pavement markings only when the air and pavement temperature are:

- 1. 50 degrees F and rising for Acrylic Water Based Paint.

H. Comply with ~~Traffic Control~~TC series Standard Drawings.

### 3.3 CONTRACTOR QUALITY CONTROL

A. Application Rate: Verify that the paint and beads are being applied within specified tolerances prior to striping.

B. Curing: Protect the markings until dry or cured. In the event that the uncured marking is damaged the marking will be reapplied and track marks left on the pavement will be removed at no additional cost to the Department.



### 3.4 REMOVE PAVEMENT MARKINGS

- A. ~~A.~~ Use one of these removal methods:
1. ~~Grinding~~
  2. ~~High pressure water spray~~
  3. ~~Sand blasting~~
  1. 4. ~~Shot blasting.~~ High pressure water spray,
  2. ~~Sand blasting.~~
  3. ~~Shot blasting.~~
  4. ~~Grinding.~~
- Grinding is not allowed on the final surfacing unless the Engineer grants prior written approval.
- B. ~~B.~~ Do not eliminate or obscure existing striping, in lieu of removal, by covering with black paint or any other ~~covering material.~~ covering.
1. The Engineer may grant prior written approval for use of black paint or other obscuring material for work durations shorter than “long term stationary” as defined in the Temporary Traffic Control section of the MUTCD.
- C. ~~C.~~ Use equipment specifically designed for removal of pavement marking material.

END OF SECTION

## Standards Committee Submittal Sheet

Name of preparer: Degen Lewis

Title/Position of preparer: Concrete Engineer

Specification/Drawing/Item Title: Dowel Bar Retrofit

Specification/Drawing Number: 02754 & PV-9

**Enter appropriate priority level:**

(See last page for explanation)

3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

With the use of this specification and drawing in several projects now, a few areas of clarification were found. The specification and drawing were also a bit more restrictive than acceptable construction practices could economically meet. The Execution section had some tasks reordered to reflect actual order of work. Changes were also made to the areas of Execution that needed to reflect changes to the standard drawing. A section requiring cores through complete dowel bar retrofits to verify initial production was added.

The standard drawing changes are mostly editorial to more accurately reflect the size and shape of the bar system and cut slots. The upper right detail had the "mid-panel crack" dual identified as "crack or joint" to reflect the two conditions detailed on the bottom half of the drawing.

The upper right detail also had a new dimension added indicating a minimum allowable length of bar in a slab. This was added since the slots are not always exactly centered on the joint or crack. This is due to the contractor cutting all six slots simultaneously with a fixed array of blades. Changes in the roadway, curvature, or crack position cause the blades to be slightly out of place longitudinally at times. The contractor could overcut

the length of the slot but this does more damage to the panel and raises costs since the grout filling in around the bars is expensive. This change to the drawing reflects what was actually happening in the field and is acceptable to the pavement designers.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

There are no changes required to the M&P.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item. Emailed to both on January 26, 2007

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

None received.

ACEC Comments: (Use as much space as necessary.)

None received.

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Changes to the Dowel Bar Retrofit specification and drawing have been reviewed and commented on by the Region Materials Engineers (RME) as part of the monthly RME meetings.

Also emailed to the Preconstruction, Traffic & Safety, Project Management, & Construction/Maintenance Groups in each Region on January 26, 2007.

No comments received.

Construction Engineers

Contractors (Any additional contacts beyond “C” above.)

Suppliers

Consultants (as required) (Any additional contacts beyond “C” above.)

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

Emailed on January 26, 2007. No comments received.

Others (as appropriate)

E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

None.

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

None.

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

None required.

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.

None anticipated.

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).

None anticipated.

3. Life cycle cost.

Should be lower as we now have a method in place to verify the contractor's installation method. We can be more sure of receiving the work intended.

G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

H. Safety Impacts?

None new. Dowel bar retrofit prevents further falting on concrete pavements constructed without dowels bars.

I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

None.

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

Priority 1      Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised.

Priority 2      Upon posting, this impacts projects being advertised.

Priority 3      Upon posting, the approved standard takes effect **four weeks** later for projects being advertised.

**Supplemental Specification  
2005 Standard Specification Book**

**SECTION 02754**

**DOWEL BAR RETROFIT**

**Delete Section 02754 in its entirety and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Procedures and materials for installing coated dowel bars across existing transverse joints and cracks.

**1.2      RELATED SECTIONS**

- A.      Section 03211: Reinforcing Steel and Welded Wire

**1.3      REFERENCES**

- A.      A. ~~ASHTO M 148: Standard Specification for~~ Liquid Membrane-Forming Compounds for Curing Concrete
- B.      UDOT Performance Data Products List (PDPL)

**PART 2      PRODUCTS**

**2.1      MATERIALS**

- A.      A. ~~Dowel Bars: 1 1/2 inch x 18 inch, smooth steel rod, following Section 03211.~~
- B.      B. ~~Bond Breaking Compound: Use a bond-breaking compound approved by the Engineer.~~
- C.      C. ~~Chair Devices: Coat according to Section 03211, or make of non-metallic materials, the devices used to support and hold the dowel bar in place. Provide a~~

minimum clearance of 1/2 inch between the bottom of the bar and the surface upon which the chair is placed.

- D. ~~D.~~—End Caps: Place on dowels, tight fitting end caps made of non-metallic materials that allows for 1/4-inch movement of the bar at each end. Submit a sample of the end caps to the Engineer for approval prior to use on the project.
- E. ~~E.~~—Caulking Filler: ~~Use a standard commercial silicone sealer specified for use with concrete surfaces.~~ Submit a sample of the caulking filler to the Engineer for approval prior to use on the project.
- F. ~~F.~~—Patching Material: Select from the UDOT ~~Performance Data Products Listing (PDPL)~~ PDPL - Portland Cement Concrete Repair Materials - Horizontal, ~~or an approved equal,~~ to replace the concrete pavement that was removed to install the dowel bars.
1. ~~Use mix with 1/4 inch nominal maximum aggregate size.~~
2. Submit a sample of the material to the Engineer for approval prior to use on the project.
- G. ~~G.~~—Joint/Crack Preservation Material: Use a rigid removable material capable of maintaining the joint or crack.

## 2.2 EQUIPMENT

- A. Jackhammers: To prevent spalling, use jackhammer less than the nominal 30 pound class.

## PART 3 EXECUTION

### 3.1 CONSTRUCTION

- A. ~~A.~~—Saw cut the pavement as required per PV Series Standard Drawings.
- B. ~~B.~~—Jackhammer and sand blast to clean all exposed surfaces and cracks, removing slurry and loose concrete.
- C. ~~C.~~—~~All~~ Clean up and properly dispose of all residues from the saw, jackhammer and sand blasting process ~~become property and responsibility of the contractor.~~

- D. ~~D.~~ Place caulking filler in existing joint or crack to prevent intrusion of patching material. See PV Series Standard Drawings.
- E. ~~E.~~ Pre-coat the dowel bars with a bond-breaking compound.
- ~~F.~~ F. ~~Place the foam core board at the middle of on the dowel bar to maintain in line with the transverse joint or crack.~~
- ~~G.~~ G. Fit the foam core board tightly around the dowel bar and to the bottom and edges of the slot.
- H. Maintain the foam core board in a vertical position and tight to all edges during placement of the patching material as per PV Series Standard Drawings.
- ~~I.~~ G. ~~Repair or replace at no cost to the Department any dowel bars damaged. Ensure Place bars so that the bars does not extend more than 11 inches past the centerline of the slot.~~
- ~~J.~~ Provide a minimum space of 1/2 inch in all directions around bar.
- K. Repair or replace any dowel bars damaged at no cost to the Department.
- ~~L.~~ H. ~~Thoroughly moisten~~ Thoroughly dampen all surfaces of the slot immediately prior to filling with patching ~~material.~~ material.
1. Prevent standing water in the slot.
2. Remove all excess water with compressed air.
- ~~M.~~ I. ~~Fill the slot with an approved patching material.~~ material.
1. Consolidate the material in the slot and around the dowel bar with an appropriate size vibrator.
2. Finish patching materials to existing surfaces.
3. Place and cure the patching material according to manufacturer's specifications.
4. specifications. Require a representative from the manufacturer of the patching material to be on-site for the first day's placement.
5. Cure using ASHTO M 148, Type 1-D, Class A.
- N. ~~J.~~ Replace any individual dowel bar retrofit not functioning or damaged at no cost to the Department.
- O. ~~K.~~ Remove joint preservation material as needed to a depth of two inches and reseal.



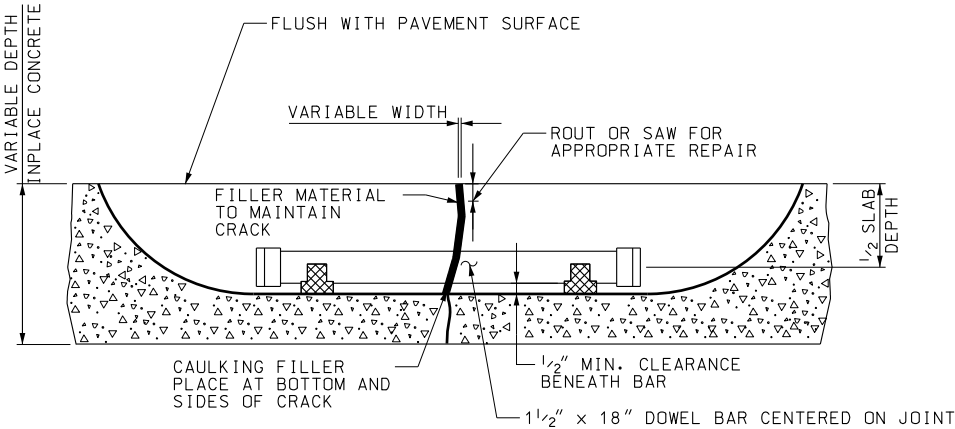
- P. Obtain cores through the slot and dowel system to verify placement of the dowel bar and consolidation of the material around the dowel bar.
1. Obtain three ~~(3)~~ cores from random locations from each of the first three production days.
  2. Cores from subsequent production days will be at the discretion of the Engineer.

END OF SECTION

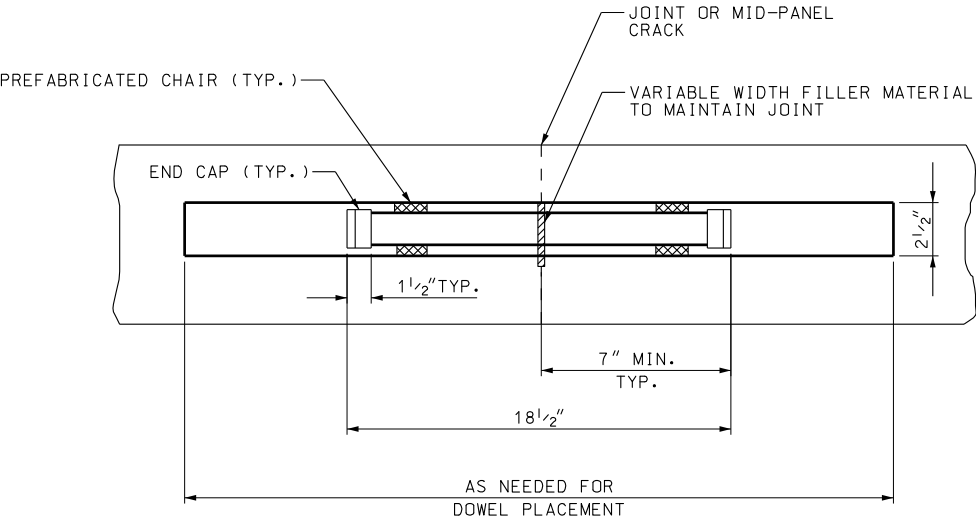
06-FEB-2007 DGN File: D:\Standards\SpecSection\Standards Committee\Meeting\11es\2007\Feb\22.07\kg\Drawings\p\09.dgn

DOWEL BAR RETROFIT

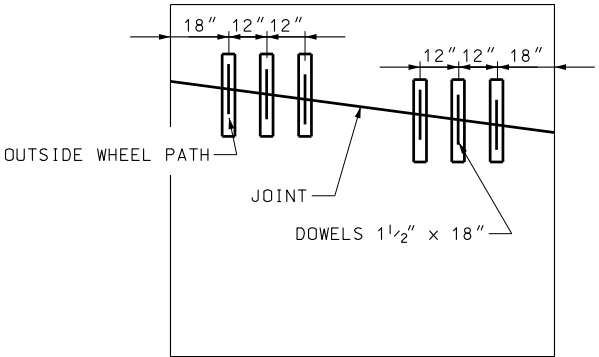
DESCRIPTION:  
THIS REPAIR IS INTENDED TO BE USED TO  
ESTABLISH/RESTORE LOAD TRANSFER AT JOINTS



PROVIDE  $\frac{1}{2}$ " CLEARANCE AROUND BAR EXCEPT FOR DEPTH OF COVER.



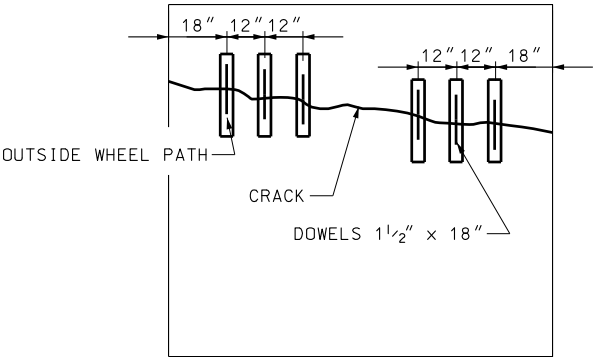
TYPICAL RETROFIT DOWEL LAYOUT  
(FOR JOINT)



TYPICAL LANE

PROVIDE DOWEL BARS PARALLEL TO THE CENTERLINE AND TO THE PAVEMENT SURFACE. LIMIT DEVIATIONS FROM PARALLEL TO  $\frac{1}{4}$ " IN THE LENGTH OF THE DOWEL BARS.

TYPICAL RETROFIT DOWEL LAYOUT  
(FOR MID-PANEL CRACK)



REVISIONS				REMARKS			
NO.	DATE	APPR.	DL	NO.	DATE	APPR.	DL
1	10/12/2006		DL				
NEW DRAWING							

UTAH DEPARTMENT OF TRANSPORTATION				STANDARD DRAWING TITLE			
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION				DOWEL BAR RETROFIT			
RECOMMENDED FOR APPROVAL				STANDARD DRAWING TITLE			
CHAIRMAN STANDARD COMMITTEE				STD DWG			
APPROVED				PV 9			
DEPUTY DIRECTOR							
DATE							
XX							
DATE							
XX.2006							

## Standards Committee Submittal Sheet

Name of preparer: John Leonard  
Title/Position of preparer: Traffic and Safety Operations Engineer  
Specification/Drawing/Item Title: Standard Drawing PV 8  
Specification/Drawing Number: Rumble Strips, Centerline Application

**Enter appropriate priority level:**

(See last page for explanation) 3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

**NOTES:**

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

This drawing was previously reviewed by the Standards Committee for approval in the February 2003 Standards Meeting. The Committee discussed it, and then placed it into suspense pending the resolution of two issues: the completion of a Research study of centerline rumble strips, and the completion of a Policy addressing both centerline and shoulder rumble strips. The Policy, 06C-17, Use of Rumble Strips has been approved, and the study of the centerline rumble strips has been completed.

After review of these two documents, the drawing has had only one modification made since the one originally presented: The speed for installation has been changed from  $\geq 50$  mph to  $\geq 45$  mph. All other aspects remain the same, and are compatible with the other two rumble strip Standard Drawings, PV 6 and PV 7, and the Use of Rumble Strips Policy.

This drawing has been used in several projects as a detail drawing sheet.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

Payment can be accomplished in the normal units, either by each, lineal foot, lump sum, etc.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)  
N/A

ACEC Comments: (Use as much space as necessary.)  
N/A

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

This drawing was reviewed with and endorsed by the Traffic Engineering Panel. Maintenance from Region One was contacted about their experience with similar style of rumble strips in a median application (Sardine Canyon) and have not expressed any concerns about the maintenance of this design. It is a similar construction technique to the one used for the installation of shoulder rumble strips used throughout the State (and referenced in STD DWGs PV-6 and PV-7). Materials has the continuing concern about any impact to the pavement surfacing by grinding away a small portion of the surface. Flush coating of the strips after milling is required to seal the surface disturbed by the grinding operation.

Construction Engineers

N/A

Contractors (Any additional contacts beyond "C" above.)

N/A

Suppliers

N/A

Consultants (as required) (Any additional contacts beyond "C" above.)

N/A

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.)  
(This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)  
FHWA was contacted (Roland Stanger, Utah Division)

Others (as appropriate)

N/A

E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

N/A

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

N/A

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

All new projects will use the new specification.

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.

The milling operation is similar to those used on shoulder rumble strips, and there should not be any change. However, on a project that is for rumble strips only (ie, no other work requiring traffic control), there may be additional maintenance of traffic requirements relating to the centerline location. These costs will need to be evaluated on a project specific basis.

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).

The milling operation is similar to those used on the shoulder rumble strips, and would likely use the same equipment. There may be additional maintenance of traffic requirements relating to the centerline location.

3. Life cycle cost.

No effect anticipated. The flush coating should seal the surface and allow the pavement to be rejuvenated on the normal maintenance cycle.

- G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

The benefits for shoulder rumble strips have previously been shown to be as high as 100:1.

- H. Safety Impacts?

The Safety impacts are significant. Review of other states using similar systems have indicated significant success. For example, in Delaware, a 2.9 mile stretch of US 301 experienced nine fatalities, all from head on collisions, in three years before installing centerline rumble strips. In the six years after installation, there have been NO fatalities. Traffic volumes on this section of road has increased 5% per year during this time. Although the total number of accidents in this stretch did not decrease significantly, the average yearly head on collisions decreased 90% and the number of accidents caused by motorists crossing the centerline decreased by 60%.

The Research study for UDOT (Evaluation of Four Recent Traffic and Safety Initiatives, Volume III: Centerline Rumble Strips on Rural, Two-Way, Undivided Highways) recommended the following:

Future installations of centerline rumble strips in the State of Utah should be pursued. The published literature on centerline rumble strips demonstrates a low cost method of (reducing) cross-over crashes on rural, two-way, undivided highways. Even though the current before and after crash data is less convincing when analyzed by more robust statistical analysis methods, the data still shows a reduction in cross-over crashes. Other advantages of centerline rumble strips are the low cost of installation, minimal maintenance costs, and improved lane delineation.

- I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

On some facilities in the State, notably US 6 from I-15 to I-70, we are experiencing serious accidents from vehicles crossing the centerline into opposing traffic. While the causes are many, including fatigue and intentional passing in a no passing zone, we believe we need the option of the centerline rumble strips as one of the tools available to us to inform the motorist of situations that require greater effort on their part to navigate the highway system.

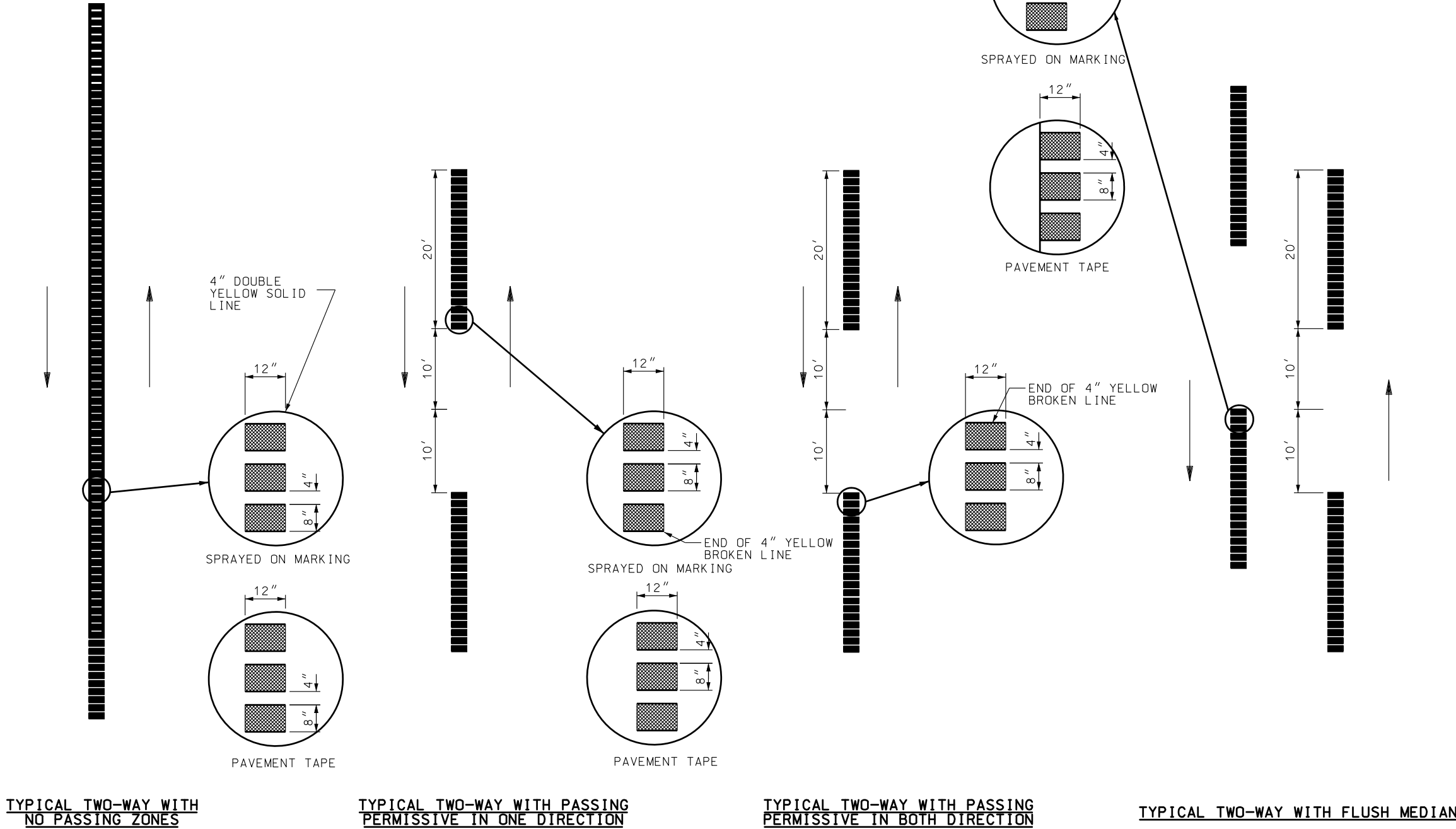
## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

- |            |   |
|------------|---|
| Priority 1 | Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised. |
| Priority 2 | Upon posting, this impacts projects being advertised.   |
| Priority 3 | Upon posting, the approved standard takes effect <b>four weeks</b> later for projects being advertised.   |

**NOTES:**

1. INSTALL CENTERLINE RUMBLE STRIPS ON HIGHWAY WITH SPEED LIMIT  $\geq$  45 MPH.
2. USE CENTERLINE RUMBLE STRIPS IN THE FOLLOWING TYPICAL UNDIVIDED HIGHWAY APPLICATIONS:
  - (1) TWO-WAY WITH NO PASSING ZONES.
  - (2) TWO-WAY WITH PASSING PERMISSIVE IN ONE DIRECTION.
  - (3) TWO-WAY WITH PASSING PERMISSIVE IN BOTH DIRECTION.
  - (4) TWO-WAY WITH FLUSH MEDIAN.
3. REFER TO UDOT STD. DWG. PV 6 FOR RUMBLE STRIP DETAILS.
4. CENTER PAINT STRIPES ON RUMBLE STRIPS.
5. PLACE RUMBLE STRIPS ON DOWN STREAM SIDE OF BROKEN LINE WHEN PRACTICAL.
6. FLUSH COAT ALL RUMBLE STRIPS.

[illegible]



# Use of Rumble Strips

Effective: March 2, 2006

**UDOT 06C-17**

## Purpose

To define the Department's use of rumble strips on the state highway system. One of the Department's strategic goals is to improve safety. This goal can be accomplished by reducing the number and severity of single-vehicle run-off-the-road crashes while preserving safe use of the roadway by bicyclists and pedestrians. Also, using centerline rumble strips can reduce head-on crashes.

## Policy

This policy applies to all highways under the jurisdiction of the Department. Placement of rumble strips will be required when the following criteria is met:

### Shoulder Rumble Strips (SRS) – Divided Highways

- SRS are required on both the left and the right shoulders of all rural interstate highways.
- Consider SRS on both shoulders of other rural divided highways (non-interstate) and urban areas.

### Shoulder Rumble Strips (SRS) – Undivided Highways

The use of SRS on undivided highways is based on criteria driven evaluation, of the following characteristics:

- For use on rural highways with speeds of 45 mph or higher.
- Adequate pavement structure exists on the shoulder.
- Run-off-the-road crash experience is documented.
- Shoulders are wide enough to provide a minimum of four feet (4') of shoulder between the SRS and the edge of paved shoulder. Increase the dimension to five feet (5') if barrier or guardrail is present at the edge of the shoulder.

### Centerline Rumble Strips (CRS) – Undivided Highways

The use of CRS on undivided highways is based on criteria driven evaluation of the following characteristics:

- For use on rural highways with speeds of 45 mph or higher.
- Head-on or opposite direction sideswipe crash experience exists.

**Deviations from Standard**~~sign exceptions~~ with regards to Rumble Strips may be granted ~~by the Engineer for Traffic and Safety under the Level 1 Elevation process~~ when:

- Another project is scheduled within two (2) years that will overlay or reconstruct the shoulders, or will use the shoulders as a detour.
- Pavement analysis determines that the pavement structure of the shoulder is inadequate for installation of SRS.
- Shoulders are less than four feet (4') wide on the left and four and one-halfsix feet (~~6'~~4.5') wide on the right.

Rumble strips are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of one foot (1') from the rumble strip to the traveled way, four feet (4') from the rumble strip to the outside edge of paved shoulder, or five feet (5') to adjacent guardrail, curb or other obstacle.

Once installed, rumble strips will be maintained. A single chip seal may be placed over the rumble strip. However, any additional chip seals or pavement overlays will result in re-establishing rumble strips.

## Standards Committee Submittal Sheet

Name of preparer: Glenn Schulte

Title/Position of preparer: Safety Specialist

Specification/Drawing/Item Title: Supplemental Specification 02843, Crash Cushions

Specification/Drawing Number: 0

Changes: Part 2, B, 1b (1), Part 2, B, 2b (1), Part 2, B, 4b, Part 2, B, 7a , Part 2, B, 8a

**Enter appropriate priority level:**

(See last page for explanation) 3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

THE GUIDELINES FOR CRASH CUSHIONS & BARRIER END TREATMENTS, 2007 EDITION, BETTER DEFINES THE SYSTEM REQUIREMENTS FOR SYSTEMS IN THE TYPE "A", TYPE "B" AND TYPE "D" CATEGORIES. FHWA DOES NOT REQUIRE THE USE OF HIGHER CAPSITY SYSTEMS THAN TL-3 AND SOME SUPPLIERS ARE SUPPLING SYSTEMS ABOVE THIS LEVEL.

THE GUIDELINES ALSO HAS REDUCED THE POST OPTIONS FOR BARRIER END TREATMENTS IN THE TYPE "G" AND TYPE "H" CATAGORIES. THIS WAS DONE AT THE REQUEST ON THE MAINTENANCE DIVISION.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

NO CHANGE

C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

No information included.

ACEC Comments: (Use as much space as necessary.)

No information included.

D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Construction Engineers

Contractors (Any additional contacts beyond "C" above.)

Suppliers

ALL SUPPLIERS GAVE THEIR INPUTS TO THE GUIDELINES FOR CRASH CUSHIONS & BARRIER END TREATMENTS, 2007 EDITION.

Consultants (as required) (Any additional contacts beyond "C" above.)

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

Others (as appropriate)

E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

NO REQUIREMENTS

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

NO REQUIREMENTS

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

NONE

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price. NONE

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming). NONE

3. Life cycle cost.

TYPES "A", "B" & "C": MAY REDUCE THIS COST BECAUSE WITH A SMALLER SYSTEM REPAIR COST WILL BE REDUCED.

TYPES "G", "H": WITH THE NEW POST OPTIONS THERE WILL BE LESS WEATHER RELATED REPLACEMENT COST.

- G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.)  
(Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

SYSTEMS THAT ARE BEING SUPPLIED WHICH CURRENTLY EXCEED THE REQUIREMENTS AT A COST OF SEVERAL HUNDRED DOLLARS ABOVE WHAT IS REQUIRED.

EXAMPLE: TL-3 (TYPE B 36" WIDE)  
6 BAY OR 8 BAY SYSTEM COST \$14K TO \$19K  
GREATER THAN TL-3  
8 BAY OR 10 BAY SYSTEM \$16K TO \$22K

PRICES TAKEN FROM CURRENT CONTRACT PRICES FOR NEW SYSTEMS.  
PRICES DO NOT INCLUDE INSTALLATION.

- H. Safety Impacts? NONE  
ALL SYSTEM ARE REQUIRED TO MEET THE MINIMUM NCHRP-350 TEST REQUIREMENTS.
- I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

- |            |   |
|------------|---|
| Priority 1 | Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised. |
| Priority 2 | Upon posting, this impacts projects being advertised.   |
| Priority 3 | Upon posting, the approved standard takes effect <b>four weeks</b> later for projects being advertised.   |

**Supplemental Specification  
2005 Standard Specification Book**

**SECTION 02843**

**CRASH CUSHIONS**

**Delete Section 02843 and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Furnish and install crash cushions
- B.      Furnish and install crash cushion markings

**1.2      RELATED SECTION**

- A.      Section 02324: Compaction

**1.3      REFERENCES**

- A.      ASTM D 4956: Standard Specification for Retroreflective Sheeting for Traffic Control
- B.      NCHRP Report 350: Recommended Procedures for the Safety Performance Evaluation of Highway Features
- C.      UDOT Guidelines for Crash Cushions and Barrier End Treatments, current edition

**1.4      SUBMITTALS**

- A.      Installer Certification.
  - 1.      Manufacturer certified installer.
  - 2.      Provide proof of certification prior to installation.

- B. Provide a letter of certification for each system location, affirming that each system is installed according to Department's and the manufacturer's specifications.
  - 1. Reference Project Number and describe Station/location indicating median, left or right shoulder or gore area application.

## PART 2 PRODUCTS

### 2.1 CRASH CUSHION

- A. Select from the current approved products list, UDOT Guidelines for Crash Cushions and Barrier End Treatments.
  - 1. Refer to the current UDOT Guidelines for Crash Cushions and Barrier End Treatments for specific uses and requirements for each approved system type. The UDOT Guidelines for Crash Cushion and Barrier End Treatments is maintained by the Division of Traffic and Safety and available through the UDOT Internet home page. Refer to <http://www.udot.utah.gov/index.php/m=c/tid=719>.
    - a. Systems tested under NCHRP-350 requirements and a letter of acceptance issued by FHWA.
    - b. Supply three sets of shop drawings and installation drawings for each system type supplied.
      - 1) Distribute drawings to Contractor, installation contractor, and Engineer or designated representative.
  - 2. Refer to CC series Standard Drawings for each approved system type.
- B. Types:
  - 1. Type A: Protect fixed hazards greater than 3 ft wide within 15 ft of traveled way, with less than 100 ft of longitudinal space in front of the hazard.
    - a. Supply system(s) with an adequate width as specified in plan set.
    - b. Supply system(s) **for the required speed as per UDOT's Guidelines for Crash Cushions and Barrier End Treatments, current edition.** ~~manufacturer's requirements for design speed as specified in plan set.~~
      - 1) ~~Supply the minimum NCHRP 350 Test Level 3 system for roadways greater than 55 MPH.~~
    - c. Galvanize all steel parts as per manufacturer's requirements.
    - d. Supply transition element, for the approach of opposing traffic, when system is installed with bi-directional traffic and the system is within 1.2 times the required minimum clear zone.
      - 1) Two transition elements required when system is installed with w-beam median barrier.
    - e. Install system on concrete pad as per manufacturer's requirements.
    - f. Supply crash cushion markings as per CC series Standard Drawings.



2. Type B: To protect fixed hazards up to 3 ft wide or less and within 15 ft of traveled way, with less than 100 ft of longitudinal space in front of the hazard.
  - a. Supply system with an adequate width as specified in plan set.
  - b. Supply system(s) **for the required speed as per UDOT's Guidelines for Crash Cushions and Barrier End Treatments, current edition.** ~~as per manufacturer's requirements for design speed as specified in plan set.~~
    - 1) ~~Supply the minimum NCHRP 350 Test Level 3 system for roadways greater than 55 MPH.~~
  - c. Galvanize all steel parts as per manufacturer's requirements.
  - d. Supply transition element, for the approach of opposing traffic, when system is installed with bi-directional traffic and the system is within 1.2 times the required minimum clear zone.
    - 1) Two transition elements required when system is installed with w-beam median barrier.
  - e. Install system on concrete pad as per manufacturer's requirements.
  - f. Supply crash cushion markings as per CC series Standard Drawings.
3. Type C: To protect fixed objects 3 ft wide or less within 15 ft of traveled way, and longitudinal space in front of the hazard greater than 100 ft.
  - a. Galvanize all steel parts as per manufacturer's requirements.
  - b. Supply double-sided w-beam transition element when system is installed in conjunction with concrete barrier or bridge parapet.
  - c. Supply crash cushion markings as per CC series Standard Drawings.
4. Type D: To protect fixed hazards within 15 ft of traveled way. Use in areas where one impact per year is anticipated or when repair history indicates two or more impacts over a three-year period.
  - a. Supply system with an adequate width as specified in plan set.
  - b. Supply system **for the required speed as per UDOT's Guidelines for Crash Cushions and Barrier End Treatments, current edition.** ~~as per manufacturer's requirements for design speed as specified in plan set.~~
    - c. ~~Supply the minimum NCHRP 350 Test Level 3 system for roadways greater than 55 MPH.~~
    - c. Galvanize all steel parts as per manufacturer's requirements.
    - d. Supply transition element, for the approach of opposing traffic, when system is installed with bi-directional traffic and the system is within 1.2 times the required minimum clear zone.
      - 1) Two transition elements required when system is installed with w-beam median barrier.
    - e. Install system on concrete pad as per manufacturer's requirements.

- f. Supply crash cushion markings as per CC series Standard Drawings.
- 5. Type E - Sand Barrel Arrays: To protect fixed hazards outside of 15 ft from the traveled way and there is an unlimited amount of space. Refer to the UDOT Guidelines for Crash Cushion and Barrier End Treatments for specific uses and requirements of sand barrel arrays.
  - a. Design sand barrel array using Energite® III/~~Fitch® Universal~~ Module Systems design manual.
  - ~~a.1)~~ Design sand barrel array to meet roadway design speed.
  - b. Certify sand barrels and components meet NCHRP-350 for non-redirective, gating crash cushions.
  - c. Sand barrels will be constructed using a frangible polyethylene material, which will shatter upon impact.
    - 1) Use yellow sand barrels.
    - 2) Permanently apply manufactured date, month, and year to each piece of the barrel system.
    - 3) Use one or two-piece barrel construction.
    - 4) Interface cones with the barrel to prevent leakage of sand but allow for the drainage of excess water for sand barrel systems that use barrel and cone configuration.
    - 5) Provide lids for each sand barrel. Fasten lid securely to barrel.
  - d. Provide sand barrels that hold the required amounts of sand as per requirements of the typical sand barrel array.
    - 1) 200 lbs., 400 lbs., 700 lbs., 1400 lbs., and 2100 lbs.
    - 2) Mark each barrel in a manner that the amount of sand required for the nominal weight is visible for systems that are designed using barrels for multiple sand weight requirements.
  - e. Use dry sand to fill modules, 2 percent or less moisture.
  - f. Supply crash cushion markings and construct pad as per CC series Standard Drawings.
- 6. Type F: Use to protect concrete barrier or bridge parapets with less than 150 ft of longitudinal space in front of the hazard. Used in a unidirectional application.
  - a. Galvanize all steel parts as per manufacturer's requirements.
  - b. Install system on concrete pad, when specified by manufacturer, and to the manufacturer's specifications.
  - c. Supply crash cushion markings as per CC series Standard Drawings.
- 7. Type G: Use to protect the approach end of single face w-beam guardrail or approach ends of bridge parapet and concrete barrier with unlimited longitudinal space (greater than 125 ft) in front of the hazard in a unidirectional application, and is installed where a tangent system is

desired. W-beam transition element is required when system is installed at the end of bridge parapet or the end of concrete barrier.

- a. Supply ~~one of the approved~~ post options as described in UDOT Guidelines for Crash Cushion and Barrier End Treatments, **current edition.**
  - b. Supply system with 12-½ ft galvanized w-beam rail elements as per manufacturer's requirements.
  - c. Supply manufacturer approved impact head and hardware.
  - d. Galvanize all steel parts as per manufacturer's requirements.
  - e. Supply crash cushion markings as per CC series Standard Drawings.
8. Type H: Use to protect the approach end of single face w-beam guardrail or approach end of bridge parapet and concrete barrier with unlimited longitudinal space (greater than 125 ft) in front of the hazard in a unidirectional application, and is installed where a flared system is desired. W-beam transition element is required when system is installed at the end of a bridge parapet or the end of concrete barrier.
- a. Supply ~~one of the approved~~ post options as described in UDOT Guidelines for Crash Cushion and Barrier End Treatments **current edition.**
  - b. Supply system with 12-½ ft galvanized w-beam rail elements as per to manufacturer's requirements.
  - c. Supply manufacturer approved impact head or end section and hardware.
  - d. Galvanize all steel parts as per manufacturer's requirements.
  - e. Supply crash cushion markings as per CC series Standard Drawings.

## 2.2 CRASH CUSHION MARKINGS

- A. Marker plate: Per CC series Standard Drawings.
1. Construct marker plate 18 inches x 18 inches using 0.032-gage aluminum with appropriate object marker sheeting.
    - a. Drill a 7/16-inch hole in each corner of plate.
    - b. Use ASTM D 4956 Type III sheeting with encapsulated glass bead retroreflective material, or greater. Use appropriate sheeting type for the substrate sheeting is placed on.
    - c. Use a 24 inch x 14 inch object marker plate or self-adhesive object marker sheeting ASTM D 4956 Type III sheeting with encapsulated glass bead retroreflective material, or greater for Type C systems. Use appropriate sheeting type for the substrate sheeting is placed on.
    - d. Substitution of self-adhesive object marker sheeting ASTM D 4956 Type III sheeting with encapsulated glass bead retroreflective material, or greater, 18 inches x 18 inches or 24 inches x 14 inches placed directly on system for Marker Plate is acceptable.

Crash Cushions

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~~November~~ February 2230, 20076

- e. Accept object markers supplied by the manufacturer that exceed the above requirements.
- B. Marker Post: Per CC series Standard Drawings
  - 1. Construct marker post, 60 inches long and 2 inches OD, using black polyethylene material.
    - a. Close top of marker post.
    - b. Drill three 7/16-inch mounting holes.
    - c. Apply three 4-inch bands of yellow sheeting ASTM D 4956 Type III sheeting with encapsulated glass bead retroreflective material, or greater.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Prepare site to finished grade prior to installation of crash cushion or barrier end treatment.
  - 1. Construct approach areas and recovery areas to meet UDOT Standards and system requirements prior to installation of system.
    - a. Refer to CC series Standard Drawings for system requirements.
  - 2. Construct concrete pad, when applicable, to meet system requirements.
    - a. Use manufactures specification for concrete pad construction.
    - b. Refer to CC series Standard Drawings for Type E - sand barrel detail, for pad requirements.
  - 3. Obtain Engineer's approval of site grading, approach and recovery areas, and layout, prior to system installation.
  - 4. Compact backfill material around posts and foundation tubes to minimum 96 percent of maximum laboratory density and dispose of excess material. Refer to Section 02324.
- B. Install in accordance with:
  - 1. UDOT Guidelines for Crash Cushion and Barrier End Treatments.
  - 2. Manufacturer's specifications and recommendations.
  - 3. Use manufacturer certified installer to perform the installation.
- C. Complete repair or replacement of any crash cushion damaged during construction within 24 hours of notification of damage.
  - 1. Contractor is responsible for the cost of repair or replacement of any permanent system damaged for any reason until final acceptance.
    - a. Exception:
      - 1) Damage is caused by an errant vehicle, AND

- 2) Damage occurs after Traffic has been established in the final lane configuration with shoulders as established in the project plans.
- b. Payment will be made using a Force Account basis for the cost of repair or replacement of the damaged system when the Engineer determines the conditions described under the exception above apply.

END OF SECTION

## Standards Committee Submittal Sheet

Name of preparer: Richard Hibbard

Title/Position of preparer: Signal & Lighting Engineer

Specification/Drawing/Item Title: Traffic Signal Specification

Specification/Drawing Number: 02892

### Enter appropriate priority level:

(See last page for explanation) 3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

Section 02892 has been completely updated to reflect current practices and to remove conflicts with recently updated standard drawings.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

Measurement and Payment does not change with these updates.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

**Email was sent – no response has been received. (January 22)**

ACEC Comments: (Use as much space as necessary.)

**Email was sent – no response has been received. (January 22)**

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Construction Engineers

The proposed specification revisions have been implemented as a special provision on numerous projects. No problems have been noted from the resident engineers at final walk through meetings.

Contractors (Any additional contacts beyond “C” above.)

Signal contractors from Cache Valley Electric, Sorenson Construction, and Hamilton Brothers have received advanced copies and have provided favorable feedback.

Suppliers

We coordinated and informed suppliers regarding the proposed revisions and updated associated UDOT procurement contracts. Other specification changes reflect updates to current equipment requirements.

Consultants (as required) (Any additional contacts beyond “C” above.)

Signal design consultants, including Horrocks, PEC, Carter Burgess, Lochner, & JUB have successfully utilized information as shown on these updates in recent project packages.

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

Discussed changes to the pedestrian button signing with FHWA. New sign meets MUTCD requirements.

Others (as appropriate)

UDOT Traffic & Safety at the complex as well as UDOT Traffic Engineers and UDOT Maintenance at each region have contributed to making these changes and updates.

- E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

None.

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

None.

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

To ensure contractors and Resident Engineers are aware of the revisions Traffic and Safety will summarize changes at Pre-Bid meetings, and other opportunities for discussion with field personnel and signal contractors.

- F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.

Minimal cost increases for minor changes to equipment specifications, clarification, and compliance with standards.

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).

No additional effort required.



3. Life cycle cost.

Some improvement will occur due to better equipment performance and reliability.

G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

Some improvement will occur due to better equipment performance and reliability. Requiring contractor certification to perform splicing will improve the reliability of vehicle detection loop installations.

H. Safety Impacts?

Vehicle LED signal module specification updated to meet current ITE standards. The overall specification is better defined to ensure consistency in LEDs specified.

I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

We have been using this specification for one year as a special provision.

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

Priority 1      Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised.

Priority 2      Upon posting, this impacts projects being advertised.

Priority 3      Upon posting, the approved standard takes effect **four weeks** later for projects being advertised.

**Supplemental Specification  
2005 Standard Specification Book**

**SECTION 02892**

**TRAFFIC SIGNAL**

**Delete Section 02765 in its entirety and replace with the following:**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- A.      Materials and procedures for installing traffic signals.
- B.      Materials and procedures for installing traffic counting loop detectors.

**1.2      RELATED SECTIONS**

- A.      Section 02741: Hot Mix Asphalt (HMA)
- B.      Section 02748: Prime Coat/Tack Coat
- C.      ~~Section 03055: Portland Cement Concrete~~ [Section 02891: Traffic Signs](#)
- ~~D.      Section 03211: Reinforcing Steel and Welded Wire~~
- [D.      Section 03055: Portland Cement Concrete](#)
- ~~E.      Section 03310: Structural Concrete~~
- [E.      Section 03211: Reinforcing Steel and Welded Wire](#)
- F.      Section [03310: Structural Concrete](#)
- [G.      Section 03575: Flowable Fill](#)
- ~~H.      Section 13554M: Polymer Concrete Junction Box (No reference in document)~~

**1.3      REFERENCES**

- A.      [AASHTO M 111: Zinc \(Hot Dip Galvanized\) Coatings on Iron and Steel Products \(Deleted in 2.2 A2\)](#)

- B. ASTM A 123: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- C. ASTM A 325: Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- D. ASTM A 307: Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- E. ASTM A 570: Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
- F. ASTM B 85: Aluminum-Alloy Die Castings

~~G. — ASTM B 117: Operating Salt Spray (Fog) Apparatus (Both references removed)~~

H. ASTM B 766: Electrodeposited Coatings of Cadmium

I. ASTM D 638: Tensile Properties of Plastic

J. ASTM D 2240: Rubber Property-Durometer Hardness

K. ASTM D 3005: Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

L. American Iron and Steel Institute (AISI)

M. American National Standards Institute (ANSI)

N. Electric Utility Service Equipment Requirements Committee (EUSERC)

~~O. — Electronics Industries Association (EIA) (Reference in 2.16 A deleted)~~

P. International Municipal Signal Association (IMSA) Standards

~~Q. — Institute of Electrical and Electronics Engineers (IEEE) (Reference in 2.16 A deleted)~~

~~R. — Institute of Traffic Engineers (ITE), Technical Reports (All references deleted)~~

~~S. — Military Specifications (Could find any reference to this one)~~

T. National Electric Code (NEC)

U. National Electrical Manufacturers Association (NEMA)

V. Pedestrian Traffic Control Signal Indicator (PTCSI) Standards

- W. Rural Electrical Association (REA) Bulletin
- X. Underwriters Laboratory (UL)
- Y. Vehicle Traffic Control Signal Head (VTC SH) Standards

Z. ~~Z.~~ 3M - 8982/Gel

#### 1.4 SUBMITTALS

- A. Certified test report of wire compliance as specified. IMSA 20-1, 50-2, 51-1, 51-3, 51-5, 51-7, 60-6.
- B. Submit samples of materials for approval when requested.
- C. Submit two copies of the following within 15 days after receiving a ~~Notice~~notice to ~~Proceed~~proceed:
  - 1. List of equipment and materials (name of manufacturer, size, and identification number).
  - 2. Detailed shop drawing, wiring diagrams, and certifications.
  - 3. ~~3.~~ Manufacturers' warranties, guarantees, instruction sheets, and parts lists.
- D. Submit UDOT Vehicle Detector and Street Lighting Splice certifications for all individuals that will perform wiring splices.

#### 1.5 ACCEPTANCE

- A. Signal Warranties and Guarantees
  - 1. The notice of acceptance for traffic signal work is not given until six months after the date of ~~the inspection~~completion of punch list items.
  - 2. During this period, all manufacturer's warranties and guarantees on Contractor-~~furnished~~ electrical and mechanical equipment are enforced.
  - 3. At the end of the period and after all electrical and mechanical defects within the scope of warranties and guarantees are corrected, the Engineer makes written acceptance of the work completed and relieves the Contractor of further responsibility for that portion of the project.
  - 4. Partial acceptance does not void or alter any terms of the Contract
- B. The six-month warranty period for signal work does not affect the processing of a semi-final estimate when the Contract is 95 percent or more complete, or after completion of work on the project.

C. Detector Loop Circuit: Conduct the following acceptance tests before and after backfill for approval by the Engineer.

1. ~~1. Measure and report in ohms, the continuity of each loop.~~
2. Value to be within 5% of calculated values.
3. Loop Resistance Formula:  $R_t = R_l + R_d$

Where:

$R_t$  = Resistance of loop as measured at pull box.  
 $R_l$  = Resistance of loop lead in wire (from the loop to junction box).  
Equal to 0.002525 ohms per meter) equals 0.0213 ohms; foot, (times 2) measured from loop to pull box splice point.  
 $R_d$  = Resistance of Loop =  $P \cdot T \cdot R_c$  (See Loop Resistance Table below)  
 $P$  = Perimeter of loop in ~~meters~~ feet  
 $T$  = Number of turns in the loop.  
 $R_c$  = Resistance of #14 AWG copper wire per ~~yard~~ foot equals ~~0.0107~~ 0.002525 ohms.

**Table 1**

<b>Loop Resistance</b>			
<b>Loop Type</b>			<b><math>R_d</math> Loop Resistance (ohms)</b>
<b>Width (ft)</b>	<b>Length (ft)</b>	<b>Turns</b>	
5	6	4	<del>.29</del> <u>0.22</u>
5	10	4	<del>.39</del> <u>0.32</u>
6	<del>6</del> <u>Circular</u>	4	<del>.31</del> <u>0.19</u>
6	<del>10</del> <u>Circular</u>	<del>45</del>	<del>.41</del> <u>0.24</u>
6	<del>12</del> <u>6</u>	4	<del>.47</del> <u>0.24</u>
6	<del>14</del> <u>10</u>	<del>34</del>	<del>.39</del> <u>0.32</u>
6	<del>16</del> <u>12</u>	<del>34</del>	<del>.43</del> <u>0.36</u>
<u>6</u>	<u>14</u>	<u>3</u>	<u>0.30</u>
<u>6</u>	<u>16</u>	<u>3</u>	<u>0.33</u>

2. ~~A minimum~~ Measure and report each loop's insulation resistance.  
Minimum acceptable reading measured between the loop conductor and ground ~~of 100~~ is 450 MΩ or greater, when tested with a 500 V megger meter.

~~3. An~~ Measure and report the inductance ~~between 65~~ of each loop.  
Acceptable inductance readings are greater than 90 μH for individual loops, and less than 1000 μH.

4. for a 4 loop group.

- D. Signal Power Circuits:
1. a. ~~Continuity~~ Measure and report continuity of ~~grounding~~ bonding conductors ~~to maintain a~~ by testing between AC+ supply and metal poles: A 1000 W Watt load at, tested to each pole to maintain frame must incur less than 2 V Volts drop, measured from the pole to the cabinet neutral conductor.
  2. b. ~~Insulations~~ Insulation resistance of supply conductors measured to ground ~~no will have not~~ less than ~~40~~ 100 MΩ of leakage (500 V megger meter).

- ~~D~~E. Video Detection Circuit: ~~Provide cabling and install State furnished video detection equipment to construct a complete~~ Demonstrate each video detection circuit ~~at each intersection specified in the project and demonstrate each circuit operates per manufacturer's specifications.~~

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Use electrical components as listed and defined by the National Electric Code (NEC).

### 2.2 SIGNAL POLE AND TRAFFIC SIGNAL LIGHT SUPPORT ARM

- A. Post ~~mounted Tapered~~ Mounted Signals Pole: ~~Standard Drawing SL-5.~~
1. 1. ~~Steel, as specified. -ASTM A-570, Grade 33.~~  
~~Allowable stresses: —  $F_b = 21,750$  psi (0.66 $F_y$ )  
 $F_v = 10,900$  psi (0.33  $F_y$ )~~
  2. Galvanized as specified. -AASHTO ~~M-111~~ A123.
  3. Wind load: 80 mph wind with 105 mph gusts.

- B. Foundation:
1. Concrete: Class AA(AE) Concrete. -Refer to Section 03055.
  2. Reinforcing steel: Coated steel. Refer to Section 03211.

### 2.3 BOLTS, NUTS AND ~~NUTS~~ HARDWARE

- A. Anchor ~~bolts~~ Bolts and ~~nuts: Follow Standard Drawing SL-5.~~ Nuts:
1. 1. ~~Steel as specified. Signal, CCTV, and Luminaire Poles use ASTM F1554 Grade 55; Signal Cabinet use ASTM A-307.~~
  2. Zinc-plated or galvanized, as specified.
    - a. Zinc-plated as specified. -ASTM B-766.
    - b. Galvanized steel: ASTM A-123.

3. ~~3.~~ Nuts: ~~free~~Free running, by hand, for total thread length of bolt.

B. Slip Bolts as specified.

1. Zinc plated: ASTM B-766.

2. ~~2.~~ Steel: ASTM A-325.

## 2.4 WIRE

A. Copper, as specified. ~~-International Municipal Signal Association (IMSA)~~

B. Size as specified. ~~-American Wire Gauge (AWG)~~

C. Service Cable:

1. Single-conductor, as specified. ~~Type THWN, THW, THHW~~Types RHH-  
USE-RHW.

D. Interconnect cable:

1. Twisted pair filled shielded cable, as specified.

~~2.~~ IMSA 60-6.

2. Single mode fiber optic cable, as specified.

E. Signal Cable:

1. Multi-colored cables, as specified.

~~2.~~ IMSA 20-1

~~F. Ground Wire:~~

~~1. Solid, bare, soft drawn, copper wire, as specified.~~

~~2. NEC 250-1.~~

~~G. Splice Sealing: Rural Electrical Association (REA) Bulletin 17551-100.~~

~~1. Rigid body re-enterable gel-filled enclosure. Meet 3M 8982/gel, or equivalent.~~

~~2. Mastie rubber pads and overwrap with vinyl electric tape.~~

~~3. ASTM D 3005, Type I or II. UL 510.~~

~~H. Color Coding Tape:~~

~~1. Vinyl electric tape, as specified.~~

~~2. UL 510.~~

~~I. Video Detection Circuit:~~

~~1. Camera circuit cable - Belden 8281 or equivalent, coaxial cable, RG 59/U Type 20 AWG.~~

~~2. Camera power circuit - 4 conductor, 14AWG SJOW cable, IMSA specification 20-1.~~

## ~~2.5 TRAFFIC SIGNAL HEAD~~

~~A. Use SL series Standard Drawings.~~

~~B. 12 inch vehicular signal heads:~~

- ~~1. With tunnel hoods and mounting brackets, square doors,~~
- ~~2. Capable of adjusting a full 360 degrees around a vertical axis in one direction.~~

~~C. Assembly:~~

~~1. LED Ball and Arrow Vehicle Signal Modules:~~

- ~~a. Modules fit into existing housing built to the VTCSH standard without modification to the modules or housing.~~
- ~~b. Arrow modules have at least three rows of LEDs. Balls must be full field design. Both ball and arrow modules must be capable of installation in signal head with reflector in place.~~
- ~~c. Ensure the measured chromaticity coordinates of modules is between 500 nm and 650 nm, conforming to the chromaticity requirements of the VTCSH standard.~~

~~2. Sections Heads:~~

- ~~a. Separate, interchangeable, and expandable without tie rods.~~
- ~~b. Stainless steel bolts, screws hinge pins, and door locking devices in any exposed sections.~~
- ~~c. Die cast aluminum parts, including the doors, as specified: ASTM B-85. Clean, smooth parts free from flaws, cracks, blow holes, or other imperfections.~~
- ~~d. Moisture and dust resistant.~~
- ~~e. All surfaces inside and out of signal housing, door, and outside of visor are painted with electrostatically applied, fused polyester paint in Highway Yellow. Inside of visor is painted flat black.~~
- ~~f. Integrally round serrated boss openings in the top and bottom of each section that receives 1.5 inch supporting pipe frame.~~
- ~~g. Rain tight top opening and an ornamental cap for closing the bottom opening.~~
- ~~h. Visor securely mounted at a minimum of four points.~~

~~F. Bonding/Grounding System Wire:~~

- ~~1. Solid, bare, soft-drawn, copper wire, as specified. Sized to meet NEC 250-1.~~

~~D. Optical Unit:~~

- ~~1. Watertight and dust resistant, mounted so various parts swing open for easy access. Provide and install green, amber, and red LED modules. Install each LED signal module in the door frame of a standard traffic signal head housing. Remove the lamp socket, reflector, reflector holder, and lens used with an incandescent lamp. Do not use with the LED signal~~



~~module. Remove socket, reflector, reflector holder, and lens and wire the LED module to the traffic signal heads.~~

G. Detector Lead-In Wire (homerun): as specified. IMSA 50-2.

~~E. Louvered back plate~~

~~1. Constructed from minimum 18-gage aluminum.~~

~~2. Both sides primed and painted flat black.~~

~~3. Designed to be attached to the signal head used.~~

## **~~2.6 PEDESTRIAN SIGNAL HEAD~~**

~~A. Follow SL series Standard Drawings.~~

H. Detector Loop Wire:

1. PVC Sensor Loop Wire – No. 14, single-conductor, stranded wire as specified. IMSA 51-3.

2. Saw Cut Sensor Loop Wire – No. 14, single-conductor, stranded wire encased in a polyethylene tube as specified. IMSA 51-7.

I. Commercially Manufactured Preformed Loop:

1. Highly abrasion-resistant alloy cover with high tensile strength braided synthetic fiber reinforcement, max. O.D. of 3/8 inch.

2. Withstand minimum pressure of 1400 psi.

3. Good flexibility over a wide temperature range and rated to withstand the temperatures of an asphalt overlay project.

4. Superior resistance to oil, gasoline, salt, moisture and impact.

5. Loops shall be individually marked as to the direction of the wire turns.

6. Manufacturer to provide minimum 15 year guarantee.

J. Splice Sealing: Rural Electrical Association (REA) Bulletin 17551-100.

1. Insulate conductors individually and encapsulate with mastic rubber pads and over wrap with vinyl electric tape. Overcoat completed splice with waterproof sealant. ASTM D3005, Type I or II. UL 510.

~~B. Includes a housing, swing down door assembly, parabolic reflector, message lens, sunshield, two signal lamps and two sockets.~~

~~1. Housing:~~

~~a. Dustproof and weatherproof.~~

~~b. Die cast, single piece aluminum alloy.~~

~~c. 1-1/2 inch top and bottom openings with integrally cast shurlock boss when used with pipe mount brackets.~~

~~d. Use stainless steel screws, springs, and assembly hardware.~~

~~2. Swing down door assembly:~~

~~a. Capable of being opened without tools.~~

~~b. Made of a single piece aluminum alloy, die cast with two hinge lugs at the bottom and two latch slots at the top of the door.~~

3. ~~Install each LED pedestrian head in the door frame of a standard pedestrian head housing. The lamp socket, reflector, reflector holder, and lens used with an incandescent lamp must be removed and not used with the LED pedestrian modules. Remove lamp socket, reflector, reflector holder, and lens and wire the LED module to the pedestrian heads.~~

4. ~~Sunshield:~~

- ~~a. Eggerate type with 15 vertical and 26 horizontal members.~~
- ~~b. Two anti-vandal, integral locking strips.~~
- ~~c. Minimum thickness of 20-gage.~~
- ~~d. Finish: 100 percent impregnated black, polycarbonate plastic, with a flat finish on both sides.~~

5. ~~Electrostatically apply synthetic enamel as specified.~~

- ~~a. Gloss black case and door frame.~~
- ~~b. Flat black sunshield.~~
- ~~c. Oven-cure finish for a minimum of 20 minutes at 350 degrees F.~~

6. ~~Pedestrian Display Signal Module~~

- ~~a. Use LED Pedestrian Signal Modules that are a retrofit replacement for the message bearing surface of a 16 inch x 18 inch pedestrian traffic signal housing built to the Pedestrian Traffic Control Signal Indicator (PTCSI) Standard. The message-bearing surface of the module shall be supplied with "HAND" and "MAN" symbol that complies with PTCSI standard for this symbol. This message-bearing surface is designed so that it can be removed from the sealed unit for replacement without further damage to the module.~~
- ~~b. Ensure the exterior of the lens of the LED Pedestrian Signal Module is smooth and frosted to prevent sun phantom.~~
- ~~c. Ensure all Portland Orange LEDs utilize "AlInGaP" technology or equivalent, and rated for 100,000 hours or more at 77 degree F and 20 mA.~~
- ~~d. Ensure the LED Pedestrian Signal Module is designed so that when operated over the specified ambient temperature and voltage range, the signal will attract the attention of, and be readable to a viewer (both day and night) at all distances from 10 ft to full width of the area to be crossed. Use a minimum of 150 LEDs in the Portland orange hand symbol and 100 LEDs in the white man symbol.~~
- ~~e. Ensure the measured chromaticity coordinates of the LED Pedestrian Signal Module conforms to the chromaticity requirements of the PTCSI Standard.~~
- ~~f. Ensure the LED pedestrian signal module is operationally compatible with the currently used controller assemblies and conflict monitors.~~

K. Color Coding Tape:

- 1. Vinyl electric tape, as specified. UL 510.

~~C. Ensure symbol messages blank out under ambient light conditions when the pedestrian signal is not energized.~~

L. Video Detection Circuit:

1. Video Detection/Camera Power Circuit Cable: As specified per manufacturer requirements.

## ~~2.7 ELECTRICAL CONDUIT~~

~~A. Conduit and fittings:~~

- ~~1. Schedule 40 PVC rated at 190 degrees F as specified. NEMA TC-2, TC-3. UL Listed.~~
- ~~2. Rigid steel as specified. UL 6.~~
- ~~3. Galvanized as specified. ANSI C80.1.~~

~~B. Casing: Smooth steel with a minimum 1/4 inch wall thickness as specified.~~

## 2.5 VEHICLE TRAFFIC SIGNAL HEAD

A. Comply with VTCSH standards. Refer to SL series Standard UDOT Drawings.

B. Signal Head Assembly:

1. 12-inch vehicular signal head as specified.
2. Separate, interchangeable, and expandable without tie rods.
3. Stainless steel bolts, screws, hinge pins, lugs, and hardware.
4. Die-cast aluminum parts, including the doors, as specified: ASTM B 85. Clean, smooth parts free from flaws, cracks, blowholes, or other imperfections.
5. Perimeter door gasket to ensure moisture and dust resistant seal.
6. Mounting hardware for securing LED module to door housing.
7. Integrally round serrated boss openings in the top and bottom of each section that accepts a standard 1.5-inch pipe mounting or universal bracket mounting hardware. Capable of adjusting a full 360 degrees around a vertical axis.
8. 6-position wiring terminal strip.
9. Tunnel visor securely mounted to the door at a minimum of four attachment points.
10. Powder coat all exterior and interior surfaces of the signal housing, door, and outside of visor in Highway Yellow. Inside of visor is painted flat black.

C. Optical Unit:

1. Mount LED Ball and Arrow Vehicle Signal Module to door housing for unrestricted easy access.

## ~~2.8 DETECTOR CIRCUIT~~

### ~~A. Wire:~~

- ~~1. Detector Lead-In Wire (feeder): as specified. IMSA 50-2.~~
- ~~2. PVC Sensor Loop Wire No. 14, single conductor, stranded wire as specified. IMSA 51-3.~~
- ~~3. Saw Cut Sensor Loop Wire.~~
- ~~4. No. 14, single conductor, stranded wire encased in a polyethylene tube as specified. IMSA 51-7.~~

### ~~B. Traffic loop embedding sealant:~~

- ~~1. Isophthalic, acid-based, unsaturated, polyester resin.~~
- ~~2. With sufficient adhesion, strength, and flexibility to:~~
  - ~~a. Withstand normal movement in asphaltic and concrete pavements~~
  - ~~b. Protect the loop wire from moisture penetration, fracture and shear.~~
- ~~3. Cured sealant resistant to motor oils, gasoline, anti-freeze solution, brake fluid, and de-icing chemicals.~~
- ~~4. Meet the physical property requirements in Table 2.~~

### D. Back Plate:

1. Constructed with minimum 18-gage aluminum.
2. Provide louvered design to reduce wind loading on mast arm structure.
2. Both sides primed and painted flat black.
3. Designed to be attached to the signal head used.

## 2.6 PEDESTRIAN SIGNAL HEAD

### A. Comply with PTCSI standards. Refer to SL series Standard UDOT Drawings.

**Table 2**

<b>Traffic Loop Embedding Sealant</b>		
<b>Physical Properties</b>	<b>Test</b>	
Shore D Hardness	ASTM D 2240	74
Specific Gravity		1.13—1.20
Styrene Monomer, percent		28—32
Viscosity: Pa·s	Brookfield Model LVF #3 Spindle @ 60 rpm	0.7-0.9
Gel Time	MEK Peroxide	11—15 minutes
Tensile Elongation, % @ Break	46-709	50
Pot life, minimum	ASTM D 638	5 minutes
Tensile Strength	ASTM D 638	2,000 psi

### B. Signal Head Assembly:

1. Provide 16-inch by 18-inch housing, swing down door assembly, and LED module.
2. Moisture and dust resistant.
3. Die cast, single piece aluminum with 1-1/2 inch top and bottom openings, and integrally cast shurlock boss. Use stainless steel screws and assembly hardware.
4. Swing down door assembly capable of being opened without tools, constructed from single piece aluminum alloy, die cast with two hinge lugs at the bottom and two latch slots at the top of the door. Universal housing with interchangeable castings for hinge and latch hardware is acceptable.
5. 3-position wiring terminal strip.
6. Provide electrostatic apply synthetic enamel as specified. Gloss black case and doorframe. Oven-cure finish for a minimum of 20 minutes at 350 degrees F.

C. Optical Unit:

1. Mount LED Pedestrian Signal and Count Down Pedestrian Signal Modules to door housing for unrestricted easy access.

## **2.7 PEDESTRIAN BUTTONS**

A. Refer to SL series Standard UDOT Drawings.

B. Pedestrian Button with LED Indicator

1. Provide pedestrian button with standard 4-bolt circle (2.60-inch +/- 0.05-inch diameter).
2. Provide ADA compliant assembly with a 2 inch diameter stainless steel actuator, rated for 100,000,000 actuations, requiring between 1 and 3 pounds of force to actuate.
3. Provide a low-movement (maximum movement of 12/1000 of an inch), pressure activated, tamper-proof, highly vandal resistant button.
4. Provide assembly with solid state electronic Piezo switch rated for 100 million cycles with no moving plunger or moving electrical contacts.
5. Provide assembly with internal circuitry with a resetting switch so as to avoid held calls to the signal controller.
6. Provide assembly with built in surge protection, with all switch electronics sealed within the cast aluminum housing. Ensure all supporting circuitry is enclosed within the button with wiring to the pushbutton terminated on two screw terminals.
7. Provide a rain-tight gasket to seal between the button assembly and the frame.

8. Provide assembly that is designed to prevent water and ice from entering or accumulating on or in the button, and that is capable of protecting the button cap from side impacts.
9. Provide button that gives feedback to the user that a call has been made in both of the following forms:
  - a. Audible beep when button is pushed.
  - b. Momentary LED light as the button is pushed, or LED light stays on for 3-5 seconds if the button is pushed and held closed.

C. Pedestrian Push Button Frame

1. Provide cast aluminum frame, powder coated black, capable of supporting push button and a 9 inch x 12 inch sign, with the following characteristics:
  - a. Frame attaches to the pole using (2) ¼ inch -20 x 1.5-inch hex head brass bolts attached behind the sign.
  - b. Frame is additionally supported using adjustable staves.
  - c. Sign attaches above the button using 8-32 stainless steel Allen-head screws.
  - d. Cable guide extends through a 7/8 inch diameter mounting hole in the support pole to channel wiring to the button.

D. Pedestrian Push Button Sign

1. Provide a 9 inch x 12 inch sign with corner radii that allow the sign to fit completely within the frame.
2. Provide a two-sided sign with markings that are in accordance with MUTCD Type R10-4b; one side of the sign with a right arrow, and the opposite side a left arrow.
3. Provide sign fabricated from aluminum with Type III High Intensity sheeting with standard 8-32 clearance holes or eyelets for mounting.

## 2.8 LED SIGNAL MODULES

### ~~2.9~~ **LUMINAIRE**

A. LED Signal Module Standards:

1. Use new LED vehicle signal modules that meet current VTCSH standards.
2. Use new LED pedestrian and countdown signal modules that meet current PTCSI standards.

~~A. Housing:~~

- ~~1. Die-cast aluminum~~
- ~~2. Reflectors, sockets, mounting cradles, and clamps fitted to the upper housing.~~

B. Physical Requirements:

1. Use modules that fit into traffic signal housing without modification to the housing.

2. Use retrofit replacement modules that only require removal of the existing optical unit components, i.e., lens, lamp module, gaskets, and reflector.
3. Watertight and dust resistant module that securely fits the housing door and wire pigtails for direct connection to wiring terminal strip. Screw-in modules are not acceptable.
4. Provide tinted lens for all LED modules.
5. Use LED modules that have the appearance of an incandescent traffic signal lens and wide angle viewing capability.

~~B. Integral ballast: Pre-wired with quick disconnect plugs mounted on a removable, hinged power door.~~

C. Additional Requirements for Pedestrian Signal Modules:

1. Provide 9-inch countdown numerals when specified.
2. Ensure symbol message blanks out under ambient light conditions when the pedestrian symbols are not active.
3. Provide circuitry that isolates man/hand symbols so they cannot be displayed at the same time.

~~C. Power Door: Ballast assembly interchangeable with all luminaires, regardless of wattage.~~

~~D. Optical assembly: Formed aluminum reflectors with a chemically bonded, non-breakable, glass finish on both the inside and outside surfaces.~~

~~E. Mogul base sockets:~~

1. ~~Adjustable with split shell, tempered brass lamp grips.~~
2. ~~Free floating, spring loaded center contacts.~~
3. ~~Heat and impact resistant glass prismatic refractors.~~

~~F. Mounting adjustment:~~

1. ~~Ten degrees above horizontal for the reflector and refractor.~~
2. ~~Five degrees adjustment from vertical on the bracket arm.~~

D. Manufacturer Warranty:

1. Provide the following minimum warranty provisions:
  - a. Replace or repair module if it fails to function as intended due to workmanship or material defects within the first 84 months from the date of delivery. If repaired, the warranty covers all parts and labor necessary or incidental to the repair.
  - b. Ensure the period of guarantee coverage, not less than the manufacturers usual and customary guarantee period. Provide all guarantees that are customarily issued by the Bidder and/or manufacturer to the State of Utah.
  - c. UDOT, or their appointee, may elect to make minor repairs, with the consent of the manufacturer. Make all other repairs under

warranty by the manufacturer. The manufacturer bears all costs including labor, parts, and shipping charges.

- d. Replace or repair all LED Vehicle Traffic Signal Modules that exhibit luminous intensities less than the minimum values specified in Article H-1a within the first 60 months of the date of delivery.

## **2.9 ELECTRICAL CONDUIT**

A. Conduit and fittings:

1. Schedule 40 PVC rated at 190 degrees F as specified. NEMA TC-2, TC-3. UL Listed.
2. Rigid steel as specified. UL 6.
3. Galvanized as specified. ANSI C80.1.

B. Steel Casing:

1. Provide smooth steel casing with a minimum 1/4-inch wall thickness and diameter as specified.

~~G. Weight: no more than 75 lbs.~~

## **2.10 VEHICLE DETECTION**

~~H. Projected area: no more than 3 square feet.~~

A. Refer to SL series Standard UDOT Drawings.

~~I. Ballast: high pressure sodium type that will:~~

- ~~1. Maintain a minimum power factor of 90 percent.~~
- ~~2. Maintain lamp wattage of not more than five percent for nominal line and lamp voltage.~~
- ~~3. Maintain regulation of not more than 35 percent for a 10 percent line voltage variation.~~
- ~~4. Start and operate the lamp at ambient temperatures down to -40 degrees F.~~
- ~~5. Sustain lamp operation for a minimum of four seconds at a voltage dip of 35 percent.~~

B. Video Detection:

1. State-furnished video detection equipment as specified. Refer to UDOT Accepted Products List for approved manufacturers.

~~J. Lamp: high pressure sodium lamp that uses clear bulbs and has:~~

- ~~1. Apparent color temperature of 2100 K.~~
- ~~2. CIE chromaticity of X = 0.512, Y = 0.420.~~
- ~~3. Rated life of not less than 24,000 hours per 10 hour start.~~

C. Induction Loop Detection:

1. PVC or preformed loops:



- a. Use for presence detection, traffic queue detection, and dilemma zone detection.
2. Saw Cut loops:
  - a. Use for presence detection, traffic queue detection, and dilemma zone detection.
  - b. Use circular loop saw or standard pavement saw. Square loops require corner cuts. Avoid saw angles greater than 45 degrees.

## ~~2.10—GROUND ROD~~

- ~~A.—Copper coated steel as specified.~~
- ~~B.—ANSI/UL 467.~~

## ~~2.11—MESSENGER~~

- ~~A.—3/8 inch diameter galvanized, stranded steel cable.~~
- ~~B.—Minimum breaking strength of 10,800 lbs. as specified.~~
- ~~C.—ASTM A 123.~~

## ~~2.12—MOUNTING BANDS AND BUCKLES~~

- ~~A.—As specified.~~
- ~~B.—American Iron and Steel Institute, (AISI) Type 201.~~

## ~~2.13—POWER SOURCE~~

- ~~A.—Pole Mount: SL series Standard Drawings.~~
  - ~~1.—Service disconnect:~~
    - ~~a.—Single pole 40 amp 120-volt AC metered for signal.~~
    - ~~b.—Double pole 20 amp 240-volt un-metered for lighting.~~
  - ~~2.—Provide a manual Electrical Utility Service Equipment Requirements Committee (EUSERC) approved circuit closing link by pass release meter socket.~~
  - ~~3.—Unmetered street lighting circuit.~~
- D. Radar Detection:
  1. Use for dilemma zone detection for typical high-speed approaches, and advance signal warning systems.
  2. Use for vehicle counting.

## 2.11 LOOP SEALANT

- A. Refer to SL series Standard UDOT Drawings.
- B. Traffic loop embedding sealant:
1. Isophthalic, acid-based, unsaturated, polyester resin.
  2. With sufficient adhesion, strength, and flexibility to:
    - a. Withstand normal movement in asphaltic and concrete pavements
    - b. Protect the loop wire from moisture penetration, fracture and shear.
  3. Cured sealant resistant to motor oils, gasoline, anti-freeze solution, brake fluid, and de-icing chemicals.
  4. Meet the physical property requirements in Table 2.

Table 2

<u>Traffic Loop Embedding Sealant</u>		
<u>Physical Properties</u>	<u>Test</u>	
<u>Shore D Hardness</u>	<u>ASTM D 2240</u>	<u>50-65</u>
<u>Specific Gravity</u>		<u>1.13 - 1.20</u>
<u>Styrene Monomer, percent</u>		<u>28 - 32</u>
<u>Viscosity: Pa·s</u>	<u>Brookfield</u>	<u>0.7-0.9</u>
	<u>Model LVF #3</u>	
	<u>Spindle @ 60 rpm</u>	
<u>Gel Time</u>	<u>MEK Peroxide</u>	<u>11 - 15</u>
	<u>46-709</u>	<u>minutes</u>
<u>Tensile Elongation, % @ Break</u>	<u>ASTM D 638</u>	<u>15 minimum</u>
<u>Pot life, minimum</u>		<u>5 minutes</u>
<u>Tensile Strength</u>	<u>ASTM D 638</u>	<u>1200 psi</u>

- ~~B. — Underground Service Pedestal: As specified. ASTM B-117, and ASTM A-123 (Cabinet). UL E-50076~~
- ~~1. — Enclosure: 0.120 inch galvanized steel or anodized aluminum.~~
    - ~~a. — 0.080 inch galvanized steel or anodized aluminum covers.~~
    - ~~b. — Finished surface with an environmental green, baked enamel over zinc-chromate primer as specified, or anodized aluminum. ASTM B-117.~~
    - ~~c. — Bottom access opening.~~
    - ~~d. — EUSERC approved circuit-closing by-pass release meter socket.~~
    - ~~e. — Baffled ventilation louvers.~~

## 2.12 LUMINAIRE

- ~~C. — Circuit Breaker: Main Breaker~~
- ~~1. — Six space metered.~~
  - ~~2. — Six space unmetered bus.~~
- A. General:

1. Die-cast aluminum housing.
2. Reflectors, sockets, mounting cradles, and clamps fitted to the upper housing.
3. High temperature wiring.
4. Luminaire weight and projected area within design loading limits.
5. Refer to SL series Standard UDOT Drawings.

~~D. Detachable, pad mount base.~~

B. Ballast Assembly:

1. Pre-wired on integral ballast with quick disconnect plugs mounted on a removable, hinged door.
2. Multi-volt, multi-watt ballast.
3. Provide correct ballast assembly for the specified lamp type:
  - a. High-pressure sodium.
  - b. Metal halide.

## ~~2.14 FLOWABLE FILL~~

~~A. Refer to Section 03575.~~

## ~~2.15 HOT MIX ASPHALT~~

B. Optical Assembly:

1. Formed aluminum reflectors with a chemically bonded, non-breakable, glass finish on both the inside and outside surfaces.

D. Mogul Base Socket:

1. Adjustable with split-shell, tempered-brass lamp grips.
2. Free-floating, spring loaded center contacts.
3. Heat and impact-resistant glass prismatic refractors.

E. Mounting Adjustment:

1. Standard Highway Luminaire (Cobra Head):
  - a. Ten degrees above horizontal for the reflector and refractor.
  - b. Five degrees adjustment from vertical on the bracket arm.

~~A. Half inch maximum. Refer to Section 02741.~~

F. Lamp:

1. High pressure sodium lamp as specified:
  - a. Clear uncoated lamp.
  - b. Apparent color temperature of 2100 K.
  - c. Rated-life of not less than 24,000 hours when used on a 10 hour per start duty cycle.
2. Metal halide lamp as specified:
  - c. Clear uncoated, pulse start lamp.
  - d. Apparent color temperature of 3800 K.

- e. Rated-life of not less than 20,000 hours (400 Watt) or 10,000 hours (250 Watt) when used on a 10 hour per start duty cycle.

## ~~2.16 LED TRAFFIC SIGNAL HEAD MODULE~~

- ~~A. Regulations and Codes. Use new modules that conform to the applicable requirements of the Underwriters Laboratory Incorporated (UL), the Institute of Electrical and Electronics Engineers (IEEE), the Electronics Industries Association (EIA), the National Electronic Code (NEC), the American Society of Testing and Materials (ATMS), the American National Standards Institute (ANSI), and the applicable standards, specifications, and regulations of the UDOT.~~
- ~~B. Ensure certification to NEMA, ITE and VTCSH Standards. Ensure LED TSMs meet current applicable NEMA standards. Bidders are required to supply a certified letter from an independent testing laboratory stating the module(s) has been tested and meets NEMA environmental standards and test procedures.~~
- ~~C. Physical and Mechanical Requirements~~
  - ~~1. Retrofit Requirements~~
    - ~~a. Use retrofit module replacements for existing signal lamps that do not require special tools for installation. Use modules that fit into existing traffic signal housing without modification to the housing.~~
    - ~~b. Use retrofit replacement modules that only require removal of the existing optical unit components, i.e., lens, lamp module, gaskets, and reflector. The module is weather tight and fits securely in the housing, and connects directly to existing electrical wiring. Screw-in modules are not acceptable.~~
    - ~~c. Use retrofit module that includes all necessary components to complete the conversion, including a one-piece gasket.~~
  - ~~2. Optical Unit Use modules capable of replacing the optical unit.~~
  - ~~3. Tinting Use tinted lens or transparent film or materials with similar characteristics.~~
  - ~~4. Lens Use module lens that is a field replaceable part without the need to replace the complete module.~~
- ~~D. Environmental Requirements~~
  - ~~1. Use modules rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40 degrees F to +165 degrees F. Use modules that incorporate temperature compensated LED technology to operate in the above mentioned temperature ranges.~~
  - ~~2. Use modules protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991, sections 4.7.2.1 and 4.7.3.2, for Type 4 enclosures to protect all internal LED, electronic, and electrical components.~~

3. ~~Use polycarbonate module lens that is UV stabilized and is a minimum of 1/4 inch thick.~~

~~E. Construction~~

1. ~~Use modules that are a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing, with the power supply integrated into the module.~~
2. ~~Use modules that have an assembly and manufacturing process designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.~~
3. ~~Use modules that are repairable by a bench technician.~~

~~F. Materials~~

1. ~~Use materials for the lens and signal modules construction that conform to ASTM specifications for the materials where applicable.~~
2. ~~Use enclosures containing either the power supply or electronic components of the signal module constructed of UL94VO flame retardant materials. The signal module lenses are excluded from this requirement.~~

~~G. Module Identification—Identify each individual module for warranty purposes.~~

1. ~~Identify each module on the backside with the manufacturer's name and serial numbers.~~
2. ~~Identify the following operating characteristics: nominal operating voltage, power consumption, and Volt-Ampere.~~
3. ~~Use modules that have a prominent and permanent vertical indexing indicator, i.e., UP ARROW or the word UP or TOP, for correct indexing and orientation inside a signal housing.~~
4. ~~Use modules conforming to this specification that have the following statement: "Manufactured in Conformance with the Interim Purchase Specification of the ITE for LED Vehicle Traffic Signal Modules" on an attached label.~~

~~H. Photometric Requirements~~

1. ~~Luminous Intensity And Distribution~~
  - a. ~~Ensure the maintained minimum luminous intensity values for modules throughout the warranty period, under the operating conditions defined in Articles D and I-2a, and at the end of the warranty period, are not be less than the values shown in Table 3.~~

**Table 3**

<b>Maintained Minimum Luminous Intensity for LED Signal Modules Candlepower Values (candelas [cd])</b>				
<b>Vertical Angle Down</b>	<b>Horizontal Angle Left &amp; Right</b>	<b>Red (12-inch)</b>	<b>Yellow (12-inch)</b>	<b>Green (12-inch)</b>

(degrees)	(degrees)	(cd)	(cd)	(cd)
2.5	2.5	339	1571	678
	7.5	251	1159	501
	12.5	141	655	283
	17.5	77	355	154
7.5	2.5	226	1047	452
	7.5	202	935	404
	12.5	145	673	291
	17.5	89	411	178
	22.5	38	178	77
	27.5	16	75	32
12.5	2.5	50	234	101
	7.5	48	224	97
	12.5	44	206	89
	17.5	34	159	69
	22.5	22	103	44
	27.5	16	75	32
17.5	2.5	22	103	44
	7.5	22	103	44
	12.5	22	103	44
	17.5	22	103	44
	22.5	20	94	41
	27.5	16	75	32

b. ~~Ensure the maximum luminous intensity for 12-inch signals do not exceed 800 candelas for the Red, 1,600 candelas for the Green, 3,700 candelas for the Yellow when operating within the temperature specified in Articles D-1 during the warranty period.~~

2. ~~Color and Brightness—Use modules that meet all ITE color and brightness specifications.~~

3. ~~Photometric Maintenance—Ensure the manufacturer has a process to test compliance of minimum intensity values in a controlled and independent laboratory during anytime in the warranty period. Alternately, ensure the manufacturer has available a portable, calibrated light meter to allow for field measurement of luminous intensity of Modules.~~

I. ~~Electrical Requirements~~

1. ~~General—Ensure all wiring and terminal blocks meet the requirements of Section 13.02 of the VTC SH standard. Two secured, color-coded, 36-inch long, 600V, 16-AWG minimum, insulated wires, conforming to the NEC, rated for service at 220 degrees F, and spaded lugs, are provided for electrical connection.~~

~~2. Voltage Range.~~

- a. ~~Ensure modules operate from a 60±3 cycle ac line power over a voltage range from 80V rms to 135V rms. The current draw shall be sufficient to ensure compatibility and proper triggering and operation of load current switches and conflict monitors in the signal controller units the Department has in use.~~
- b. ~~Ensure nominal operating voltage for all measurements is 120±3 volts rms.~~
- c. ~~Ensure fluctuations in voltage over the range of 80V rms to 135V rms do not affect luminous intensity by more than ±10 percent.~~
- d. ~~Ensure the LED circuitry prevents flicker at less than 100 Hz over the voltage specified in Articles I-2a.~~
- 3. ~~Transient Voltage Protection—Ensure module on-board circuitry includes voltage surge protection to withstand high-repetition noise transients and low-repetition, high-energy transients as stated in Section 2.1.6, NEMA Standard TS-2, 1992~~
- 4. ~~LED Drive Circuitry—Ensure individual LED light sources are wired so that a catastrophic failure of one LED light source will result in the loss of not more than 20 percent of the signal module light output.~~
- 5. ~~Electronic Noise—Ensure the LED signal and associated onboard circuitry meets Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.~~
- ~~6. Power Factor (Pf) and AC Harmonics:~~
  - a. ~~Ensure modules provide a power factor of 0.90 or greater when operated at nominal operating voltage, and 77 degrees F.~~
  - b. ~~Ensure total harmonic distortion induced into an ac power line by a Module, operated at nominal operating voltage, with power consumption equal to or greater than 15 watts at 77 degrees F does not exceed 20 percent.~~
  - c. ~~Ensure total harmonic distortion induced into an ac power line by a Module, operated at nominal operating voltage, with a power consumption equal to or less than 15 watts at 77 degrees F does not exceed 40 percent.~~
- 7. ~~Failed State Impedance—Ensure modules are designed to sense a loss of light output due to catastrophic LED failures of between 25 to 40 percent. Loss of light output due to LED failure is not detected of losses of less than 25 percent but is detected for any loss of light greater than 40 percent. Ensure the unit, upon sensing a valid loss of light, presents an impedance of 500 K ohms to the ac line.~~
- 8. ~~Electronics Technology—Ensure modules use the latest 0.20-inch (5 mm) electronics technology.~~

## 2.13 GROUND ROD

- A. Copper-coated steel as specified.
- B. ANSI/UL 467.

## 2.14 MESSENGER CABLE

- A. 3/8 inch diameter galvanized, stranded steel cable.
- B. Minimum breaking strength of 10,800 lbs. as specified.
- C. ASTM A 123.

## 2.15 MOUNTING BANDS AND BUCKLES

- A. As specified.
- B. American Iron and Steel Institute, (AISI) Type 201.

## 2.16 POWER SOURCE

- ~~J. Manufacturers Certification of Compliance and Warranty Provisions:~~
  - ~~1. Certificate of Compliance—Ensure manufacturers provide a Certificate of Compliance to this specification for each shipment of Modules. Identify each Module per Section G.~~
  - ~~2. Warranty Provisions—Ensure Bidder provides the following minimum warranty provisions:~~
    - ~~a. Replace or repair module if it fails to function as intended due to workmanship or material defects within the first 84 months from the date of delivery. If repaired, the warranty covers all parts and labor necessary or incidental to the repair.~~
    - ~~b. Ensure the period of guarantee coverage, in no case, is less than the manufacturers usual and customary guarantee period. Provide all guarantees that are customarily issued by the Bidder and/or manufacturer to the State of Utah.~~
    - ~~c. The Bidder may elect to have UDOT make minor repairs or their appointee, with the consent of the manufacturer. Make all other repairs under warranty by the manufacturer. The manufacturer bears all costs including labor, parts, and shipping charges.~~
    - ~~d. Replace or repair all LED Vehicle Traffic Signal Modules that exhibit luminous intensities less than the minimum values specified in Article H-1a within the first 60 months of the date of delivery.~~

## ~~2.17 VIDEO DETECTION CIRCUIT~~

- A. Refer to SL series Standard UDOT Drawings.
- B. Pole Mounted Service:



1. NEMA wet service rated service enclosure.
2. Provide a manual Electrical Utility Service Equipment Requirements Committee (EUSERC) approved circuit closing link by-pass release meter socket.
3. Other requirements as specified and as required by the local power company. Provide a product consistent with specifications for Underground Service Pedestal.

~~A. Provide conduit, cabling and lighting, and install State-Furnished video detection equipment as shown in the plans to construct a complete and operational video detection circuit at each intersection.~~

C. Underground Service Pedestal:

1. Service Disconnect:
  - a. Provide pedestal rated for 100-amp, 1-Phase 3-wire 120/240v service.
  - b. Provide 200-amp utility landing lugs rated for 250 MCM wire.
  - c. Provide pedestal that is split into an "un-metered" and a "metered" side.
  - d. Provide plug in circuit breakers that are UL approved, industrial grade, and rated for 10K AIC minimum.
  - e. Provide (1) double pole 70-amp main circuit breaker labeled "Metered Main" and (1) single pole 40-amp circuit breaker labeled "Traffic Signal" with minimum capacity for (4) metered single pole circuit breakers. Ensure Traffic signal circuit breaker is secondary to the metered main breaker.
  - f. Provide (1) double pole 50-amp main circuit breaker labeled "Un-metered Main" and (1) double pole 20-amp circuit breaker labeled "Lighting" with minimum capacity for (4) un-metered double-pole circuit breakers. Ensure lighting circuit breaker is secondary to the un-metered main circuit breaker.
2. Provide pedestal that is pre-wired according to NEC and NEMA Specification with UL approved copper XHHW-2 cable bussing, fully rated. Ensure there are provisions for terminating to a ground rod.
3. Provide pedestal with UL 508 rating.
4. Provide self-standing NEMA 3R cabinet (direct burial pedestals are not acceptable) with gasket in place, fabricated of 0.120 inch minimum thickness anodized aluminum. Ensure all exterior components are rustproof. Ensure exterior has no exposed hardware except for handles.
5. Meet EUSERC requirements for all mounting hardware and installation details. Fit with EUSERC approved power meter base with manual link bypass.
6. Provide pedestal with service entrance, meter and distribution compartments with a corrosion resistant barrier to separate each compartment. Provide access panel or door with stainless steel piano hinges.

7. Provide cabinet with sealed window(s) of shatter resistant Lexan (or equivalent). Ensure the meter can be read from the front of the cabinet.
8. Ensure documentation is permanently and conveniently attached. Ensure documentation includes the manufacturer's name, address, phone number, a wiring diagram, date of manufacture, and all necessary information to order an identical pedestal and replacement parts.
9. Provide labels that are permanent (etched or engraved) and mechanically fastened to the cabinet. Label the front exterior of the cabinet "UDOT SIGNAL AND LIGHTING DISCONNECT"

~~B. Provide all additional mounting brackets, termination boxes, and other equipment, material and labor necessary to construct a complete and operational video detection circuit per manufacturer recommendations.~~

## 2.17 FLOWABLE FILL

- A. Refer to Section 03575.

## 2.18 HOT MIX ASPHALT

- A. Half-inch maximum. Refer to Section 02741.

## 2.19 MAST ARM SIGNS

- A. Provide sign fabricated from aluminum with Type III High Intensity sheeting (minimum). Refer to Section 02891.

# **PART 3 EXECUTION**

## **3.1 PREPARATION**

- A. Conform to the National Electrical Code (NEC).

~~B. Pick up~~ Coordinate State-furnished materials at Furnished Materials:  
Pick up at the Department's Central Warehouse, 4501 South 2700 West, Salt Lake City, UT.

~~C. Saw cut concrete or other improved surfaces. Contact the warehouse to be removed in the sidewalk area, and replace with in-kind materials to match the existing grade.~~

1. ~~D. Attach brackets with schedule~~ a banding machine with stainless steel bands. Do not drill holes in poles except as shown on the plans. Follow SL-series Standard Drawings. pickup.

2. ~~E~~Pick up drop shipment materials at location specified.
- C. Do not disconnect or remove an existing signal system until the replacement system is functioning.
- ~~F~~D. Contact power company at least 30 days before the connection date, and verify the exact location, voltage, procedure, and materials required by the power company.
- E. Pothole, locate, and expose any utility that will conflict with drilling, trenching, or boring work associated with placement of signal/pedestrian poles and conduit.
- F. Reuse materials only as specified or as approved by the Engineer.

### 3.2 CONSTRUCT POLE FOUNDATION

- A. ~~F~~ollowRefer to SL series Standard UDOT Drawings.
- B. Concrete: AA(AE) required. Refer to Section 03055.
- C. Structural Concrete: Refer to Section 03310.
- D. Reinforcing Steel and Welded Wire: Refer to Section 03211.
- E. Do not weld reinforcing steel, anchor bolts, or conduit.
  1. Use tie wire to secure conduit.
  2. Use template to align and secure anchor bolts.
- F. ~~F.~~ Place ~~the~~ concrete directly ~~into the~~ excavation, ~~and use~~ Use minimum forming above ground.

### 3.3 ~~TRENCH~~STEEL PLACEMENT

- A. Install poles plum (vertically straight).
- B. For signal poles, tighten anchor bolt nuts to snug-tight plus 1/3 turn.
- C. For poles with break-away slip base systems, tighten anchor bolt nuts as shown on SL series Standard UDOT Drawings.
- D. Field assemble two-piece mast arm slip joint to achieve a snug fit. Apply anti-seize compound and provide overlap not less than 1.5 times inside diameter of end section.

### 3.4 TRENCHING AND DIRECTIONAL BORING FOR CONDUIT

- A. Trenching Paved Surface (asphalt concrete):
1. Do not use backhoe.
  2. Make the trench 6-inches wide or less.
  3. Use flowable fill to within 3-inches of the existing roadway surface.
  4. Evenly apply tack coat before final backfill.
  5. Match the composition, density, and elevation ( $\pm 3/16$ -inch) of the existing surface in the final 3-inches of backfill.
- B. Trenching Unpaved Surface:
1. Use backfill that matches the composition, density, and elevation ( $\pm 3/16$ -inch) of the existing surface.
  2. Install conduits that cross finished curbs and gutters, sidewalks, concrete flatwork, textured or decorative surfaces by jacking, drilling, or pushing. Entirely replace any damaged section at no additional cost to Department.
  3. Dispose of surplus material daily.
- ~~D.~~ ~~C.~~ Trenching under Railroad (~~Subject to agreement with railroad~~):
1. ~~Install smooth steel casing a minimum depth of 4 ft under railroad track to house conduit. As specified in railroad agreement.~~
  2. ~~Six inch diameter casing with a minimum 7/32 inch wall thickness, and a minimum yield strength of 34,950 psi.~~
- ~~D.~~ E. Minimum cover of conduit:
1. Minimum cover for all roadway crossings: ~~2 ft.~~ 24-inches for conduit placed in trench; and 36-inches for directional bore conduit.
  2. Minimum cover off roadway without concrete encasement or capping: 18-inches.
  3. Minimum cover off roadway with concrete encasement or capping with minimum thickness of 2-inches: 12-inches.
- F. Directional Boring:
1. Directional boring is an approved alternative to trenching unless otherwise specified.

### 3.45 INSTALL CONDUIT

- A. Place all conduits in the same trench before surfacing.
- B. ~~Above ground use~~ Use galvanized rigid steel; conduit above ground. Use PVC conduit under ground ~~use PVC.~~

- C. Seal uncapped conduit ends inside junction box with at least 2--inches of duct caulking or PVC cap.
- D. ~~In future-use conduit, install~~ Install No. 14 AWG single conductor copper, type THHN pull wire in all unused/future-use conduit.
  - 1. On each end of conduit install cap with 7/32--inch hole for pull wire.
  - 2. Leave 20--inches of wire outside of the cap, fastened securely.
  - 3. Place future-use conduit in top portion of ~~trench~~ junction boxes for ~~easier~~ future access ~~later~~.
- E. Secure conduit on structures with standard galvanized iron conduit clamps using at least 5/16--inch diameter concrete expansion anchors at maximum ~~5-ft~~ 60-inch spacing.
- F. Use conduit expansion fittings at structure expansion joint crossings.

### 3.56 **INSTALL WIRING**

- A. Conductors:
  - 1. Clean and dry the inside of the conduit before installing conductors.
  - 2. Install grounding conductor in all power circuit conduits.
  - 3. Use powered soapstone, talc or other approved lubricants when pulling conductors in conduit.
  - 4. Tape the ends of unused conductors and label them as spares.
  - 5. Use conductors that are color coded as specified. See table 4. Meet IMSA 20-1.
- B. Bonding Conductor (Ground-wire) Wire:
  - 1. ~~In all non-metallic conduit, a ground wire must run~~ Size bonding wire in conformance to NEC article 250. Run continuously and ~~be grounded at bond to~~ each junction box, except in those conduits used solely for interconnect and detector circuits. metal signal pole.
  - 2. Bond the ~~ground wire~~ grounding system conductor to the ground rod in each junction box except in circuits with less than 50 V.
- C. ~~Neatly arrange~~ Arrange the wiring neatly within cabinets, junction boxes, fixtures, etc.
- D. Terminate all terminal connections by a mechanical (spade) connector.
- E. Loop Detection Wire ~~splicing~~ Splicing:
  - 1. ~~Splice wires~~ Cable splices are only permitted in detection circuits where the wire type changes in the junction boxes. No other splices are allowed.
  - 2. ~~Mechanically secure or solder, individually insulate, and water seal all splices. Encapsulate in a rigid body re-enterable gel-filled~~

~~enclosure, or cover.~~ Strip insulation back on the ends of the shielded cable wires and all of the loop wires that are to be joined in series to allow a non-insulated butt splice to be crimped onto them with ~~mastic rubber pads~~ a 1/8-inch of copper extending past the end of the butt splice.

- b. Strip loop ends as needed. Strip home run cable as needed and ~~overwrap with vinyl~~ cut off the bare conductor drain wire. Use non-insulated butt splice connectors and crimp the loop leads to the home run leads then solder these connections.
- c. When all pairs have been joined in this manner use an electric or butane soldering iron to solder the splices ensuring that solder covers the splice inside and out. Do not melt the insulation.
- d. Wrap each soldered connection with black tape and mastic tape to insure the non-insulated butt splices will not short circuit. Wrap entire splice with mastic tape then wrap the entire splice area with black tape. Be sure to overlap the outer sheaths on the home run and the loop leads by 1-inch. Liberally apply waterproof sealant over the black tape and let dry.
- e. Use a nylon tie wrap to secure the loop leads at the best location possible inside the pull box. Provide loop leads that are at least 48-inches long as measured from the top of the pull box to allow the Contractor to work on the splice above the box.

F. Mark cabinet cables with colored vinyl electrical ~~color coding~~ tape as specified ~~aeecording to in~~ Table 4-3. Meet UL 510.

G. Connect conductors according to Table 4.

**Table 3**

Cables Marked with Colored Tape				
	Northbound P2	Southbound P3	Eastbound P4	Westbound P1
<b>Signal Circuit</b>	Blue	Red	Yellow	Orange
<b>Detector Circuit</b>	Blue	Red	Yellow	Orange
	<b>Circuit Coding</b> One band, = Through, <del>2</del> Two bands, = Left Turn, <del>3</del> Three bands, "Q's" = Queue, Four bands, = Dilemma			
<b><u>Pedestrian Head Circuit</u></b>	Blue & Green	Red & Green	Yellow & Green	Orange & Green
<b><u>Pedestrian Button Circuit (3)</u></b>	Blue & White	Red & White	Yellow & White	Orange & White

~~G.~~ ~~Connect conductors according to~~  
**Table 5.4**

**Table 5**

Color-Coded Conductors		
	North-South	East-West
<b>Seven-Conductor Pedestrian Circuit</b>	Red – Don't Walk Green -Walk White – Neutral	Black - Spare Orange – Don't Walk Blue - Walk White with Black Tracer - Neutral
<del>Three</del> <u>Four</u> - <b>Conductor Pedestrian Head Circuit <u>Push Button Circuit</u></b>	Red <del>—</del> Pedestrian Call White - Common	Black - Pedestrian Call White - Common
<b>Seven-Conductor Signal Circuit</b>	White <del>—</del> Neutral Red - Red Through Orange - Yellow Through Green - Green Through Blue - Green Arrow White with Black Tracer - Yellow Left Black - Left red or spare	

### **3.6** INSTALL DETECTOR LOOPS

- A. ~~Follow~~Refer to SL series Standard UDOT Drawings.
- B. One turn is once around the perimeter of the loop with the same conductor.
  1. Use number of turns as specified in Table 1 (Loop Resistance Table).
  - ~~2.~~ 2. ~~Do not allow twists in the loop.~~
  3. No splices are allowed in loop
- C. Loop lead-in from loop to junction box:
  1. Minimum of 3 twists per ~~yard~~foot in saw cut.
  2. Minimum of ~~10~~6 twists per ~~yard~~for foot inside of conduit.
  3. Do not interweave with other loop lead-ins.
  4. Each lead-in requires a separate conduit.
- D. For Detector Lead-in (feeder) from the junction box to controller cabinet, carry shield continuity across all splices.
- E. Saw cut loop:

1. ~~Round the corners with a minimum of 2-inch drill.~~ Only circular loops may be saw cut into existing surfaces.
2. Remove all loose material and wash and dry all saw cuts.
3. Place all loop wire in a ~~1/4-~~ 1/4-inch polyethylene tube.
4. Seat the conductor with no damage at the bottom of the slot. Place 1-inch backer rod pieces 18-inches along saw slot to prevent loop wires from floating upward in sealant.
5. Fill the saw cut with embedding sealant; surround the polyethylene tube to the level of the existing roadway surface ~~± 1/4-inch.~~ Remove any excess embedding sealant.

F. ~~PVC~~ Preformed loop:

- ~~1.~~ 2. ~~1.~~ Trench ~~2-6-inch~~ maximum width with ~~4-6-inch~~ minimum to ~~6-12-~~ inch maximum cover. in order to place loops below the pavement section.
- ~~2.~~ 2. ~~Loops that are more than 8 inches below finished surface will have an additional turn in them to compensate for reduced sensitivity.~~
- ~~3.~~ 3. Anchor sensor loops to prevent movement or floating.
- ~~4.~~ 4. ~~Apply~~ For loops trenched under existing asphalt, apply a tack coat to the sides and the bottom of ~~the remaining 3 inches of~~ trench and backfill with hot mix asphalt, 1/2 -inch maximum aggregate mix. Refer to Sections 02741 and 02748. Compact with flat nose on a jack hammer in 3-inch maximum lifts.
- ~~45.~~ 45. Loops ~~in~~ under new pavement are to be preformed and placed 1 ~~3/4-~~ 3/4- inches below the surface of the base course and backfill with surrounding material.

### **3.78 INSTALL POWER SOURCE**

- A. Verify the exact location, voltage, procedure, and materials required by the power company.
- B. ~~Follow~~ Refer to SL series Standard UDOT Drawings.

### **3.89 INSTALL LUMINAIRE**

~~A. As specified.~~

~~B. Follow SL series Standard Drawings.~~



### ~~3.9 — INSTALL SIGNAL HEAD~~

- ~~A. — Do not install signal heads at the intersection until ready for operation.~~
- ~~B. — If turn on is not immediate, completely cover the signal heads with non-transparent, non-paper material tied securely around head.~~
- ~~C. — Install directed and veiled optically-programmed signals following the manufacturer's instructions. Mask each section of the signal with prescribed materials.~~
- ~~D. — Use louvered back plates on all signal heads except Type V and VI. Use a minimum of four 1/8 inch stainless steel screws per section to mount the back plates, or according to manufacturer's instructions.~~

### ~~3.10 — REMOVE AND SALVAGE EXISTING EQUIPMENT~~

- ~~A. — Light poles, signal poles, messenger cable, signal and pedestrian heads, controller cabinets, other items as specified on the plans remain the property of the Department.~~
- ~~B. — Transport items to the specified location.~~
- ~~C. — Remove foundations to a depth of at least 6 inches below the existing surface.~~
- ~~D. — Backfill all holes with local material and compact to the density of the surrounding area.~~

### ~~3.11 — INSTALL VIDEO DETECTION~~

- ~~A. — Install all video detection components in accordance with the manufacturer specifications.~~
- ~~B. — Mount each video detection camera on the signal mast arm using the State-Furnished 46-inch extension pole and mounting bracket.~~
- ~~C. — Aim and set camera position and program detection areas as directed by the Engineer.~~
- A. — As specified.
- B. — Refer to SL series Standard UDOT Drawings.

### **3.10 INSTALL SIGNAL HEAD**

- A. Refer to SL series Standard UDOT Drawings.
- B. Do not install signal heads at the intersection until ready for operation.
- C. If turn on is not immediate, completely cover the vehicle signal heads with orange non-transparent, plastic garbage bags tied securely around the signal head. New signal heads must not block active existing signals prior to new signal turn on.
- D. Install optically-programmed signal heads in accordance with the manufacturers instructions.
- E. Use louvered back plates on all signal heads except Type V.
- F. Use cable straps for all universal signal mounts.

### **3.11 INSTALL MAST ARM SIGNS**

- A. Attach mast arm sign with mounting brackets using stainless steel straps. Do not drill holes in poles except as shown on the plans.
- B. Mount sign on mast arm so that the legend/message is horizontal, even if on a curved section of mast arm.

### **3.12 REMOVE AND SALVAGE EXISTING EQUIPMENT**

- A. Light poles, signal poles, messenger cable, signal and pedestrian heads, controller cabinets, other items as specified on the plans remain the property of the Department.
- B. Transport items to the specified location.
- C. Remove foundations to a depth of at least 6-inches below the existing surface.
- D. Backfill all holes with local material and compact to the density of the surrounding area.

### **3.13 INSTALL VIDEO DETECTION**

- A. Install all video detection components in accordance with the manufacturer specifications.

- B. Mount each video detection camera on the signal mast arm using the State-Furnished 46-inch extension pole and mounting bracket. Refer to SL series Standard UDOT Drawings for camera placement mount.
- C. Video detection cameras are to be installed under the direction and supervision of UDOT staff, as specified. Provide a fully functional detection system.

END OF SECTION

## Standards Committee Submittal Sheet

Name of preparer: Richard Hibbard

Title/Position of preparer: Signal & Lighting Engineer

Specification/Drawing/Item Title: Pedestrian Signal Assembly

Specification/Drawing Number: Standard Drawing SL 09

### Enter appropriate priority level:

(See last page for explanation)

3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

Standard Drawing SL 09 has been updated to reflect current requirements for pedestrian features as specified in ADA requirements and the MUTCD. The new sign (R10-4b) is larger than the existing one and utilizes graphics and minimal legend.



New Sign R10-4b  
9" x 12"



Existing Sign  
5" x 7 3/4"

The new ped button is more durable and vandal and tamper resistant. The new button assembly also provides user feedback by sounding a beep and illuminating an LED light. Once the button has been pressed, the user knows that a call has been placed with the signal controller.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

Measurement and Payment does not change as a result of these updates.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

**Email was sent – waiting for response. (Sent in November)**

ACEC Comments: (Use as much space as necessary.)

**Email was sent – waiting for response. (Sent in November)**

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Construction Engineers

**No comments.**

Contractors (Any additional contacts beyond “C” above.)

Signal contractors from Cache Valley Electric, Sorenson Construction, and Hamilton Brothers have received advanced copies and have provided favorable feedback. The only concern is implementation of the new button. They may have stock on hand that they would like to use. *Please note: We notified the contractors early in the process that the change will take place beginning with the 2007 construction season and to plan accordingly.*

Suppliers

Suppliers have been contacted, and have provided samples, as part of securing a procurement contract to purchase the new style pedestrian push button, frame, and sign shown on Drawing SL 09.

Consultants (as required) (Any additional contacts beyond “C” above.)

Signal design consultants, including Horrocks, PEC, Carter Burgess, Lochner, & JUB have successfully utilized information as shown on these updates in recent project packages.

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

**Email was sent – waiting for response. (Sent in November)**

Others (as appropriate)

UDOT Region Traffic Engineers and Maintenance offered the following minor concerns regarding implementation of this change:

1. The new sign will be installed on all new projects and as replacement for maintenance.
2. There will be no wholesale change out to the new standard.
3. The larger ped sign dimensions (9” x 12”) will likely require separate ped poles.  
*Please note two signs will fit on a signal pole.*

UDOT Traffic and Safety Signing Engineer, John Leonard has no concerns regarding implementation of this change.

- E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)

1. Minimum Sampling and Testing Guide (MS&T Guide)

None.

2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)

None.

3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)

F. Costs? (Estimates are acceptable.)

1. Additional costs to average bid item price.

The new pedestrian button, as specified, will cost twice as much as the old button (about \$70 instead of \$35). We expect to recover that cost because the button will last approx three times as long. It is more durable and requires less maintenance.

2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).

No additional time or effort to install.

3. Life cycle cost.

G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.) (Estimates are acceptable.) (If no costs, what is the benefit of making this change?)

The new pedestrian button is much more durable than the current design. It is resistant to tampering and vandalism.

H. Safety Impacts?

Drawing SL 09 has been updated to reflect current requirements for pedestrian features as specified in ADA requirements and the MUTCD.

I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.

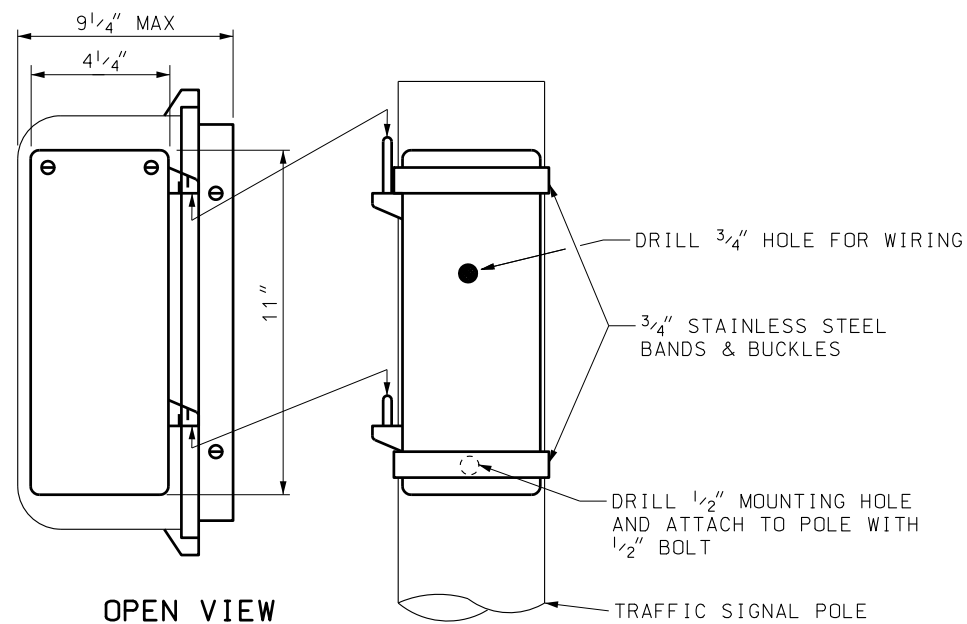
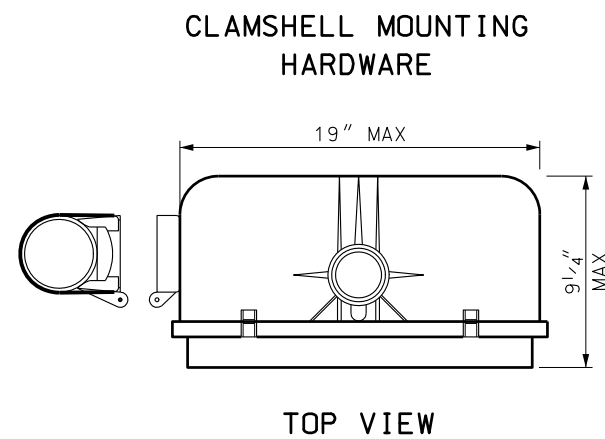
Drawing SL 09 has been updated to address concerns by FHWA that our current practices did not comply with the MUTCD. The drawing, as submitted now, is fully compliant with ADA requirements and the MUTCD.

## Priority Explanation

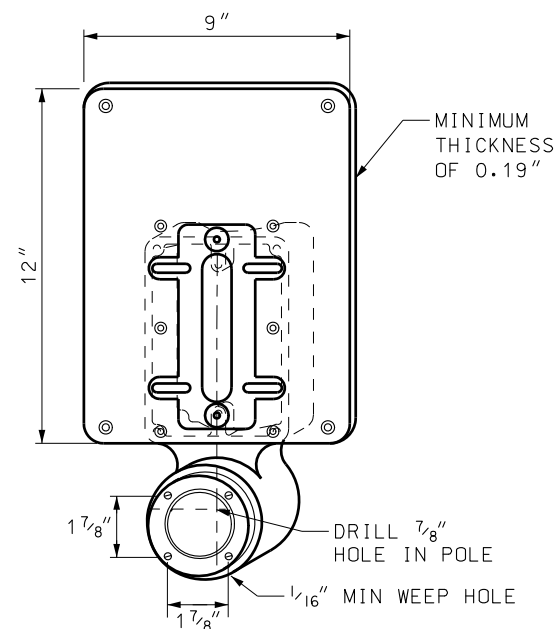
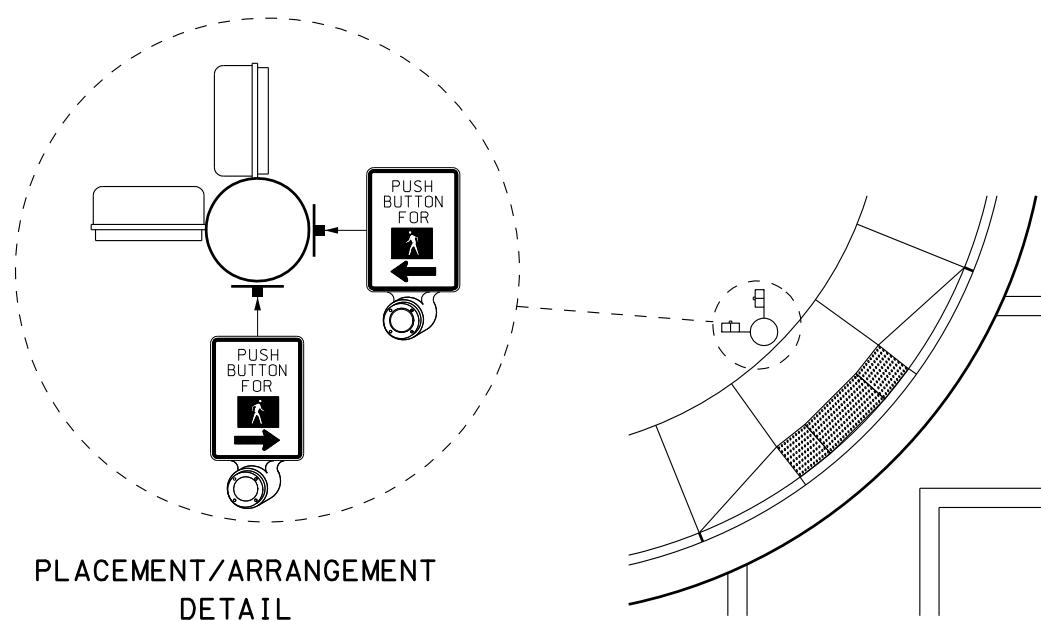
Enter the appropriate priority in the box on the first page of the document.

- |            |   |
|------------|---|
| Priority 1 | Upon posting, this impacts all projects in construction and design with a Change Order, Addenda, and immediate change to projects being advertised. |
| Priority 2 | Upon posting, this impacts projects being advertised.   |
| Priority 3 | Upon posting, the approved standard takes effect <b>four weeks</b> later for projects being advertised.   |

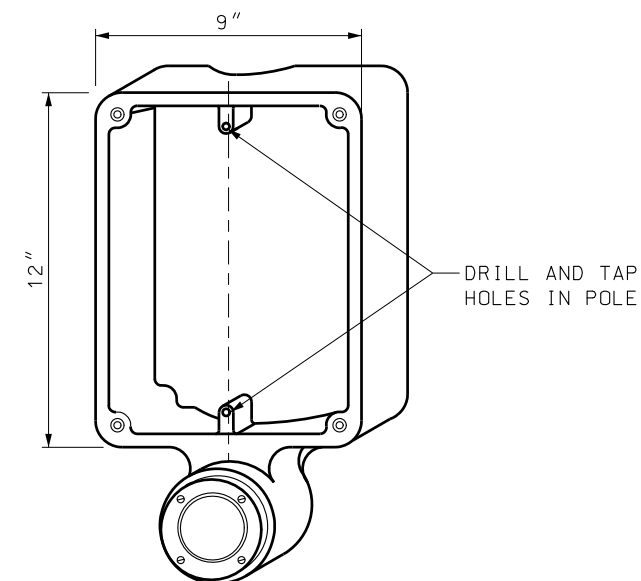




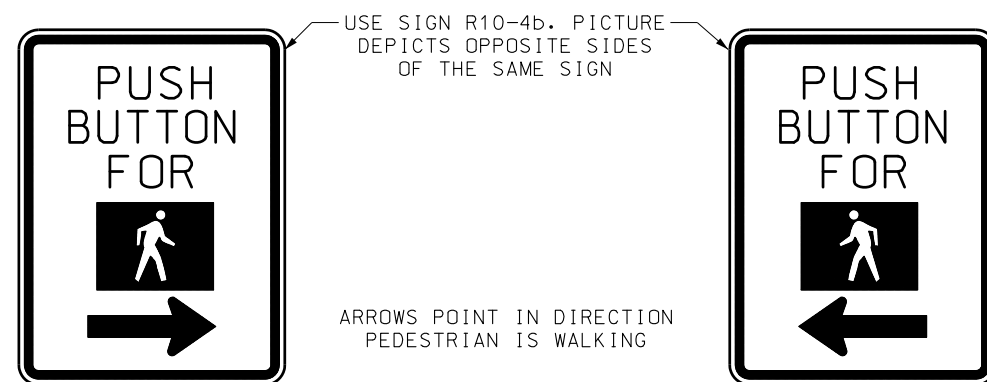
TYPICAL MOUNTING OF PEDESTRIAN SIGNAL AND PUSH BUTTON ON A SIGNAL POLE



OPTION 1  
FRAME TO ACCOMMODATE  
5" x 7" SIGN WITH ADAPTOR  
PLATE FOR 9" x 12" SIGN



OPTION 2  
FRAME TO ACCOMMODATE  
9" x 12" SIGN



NOTES:

1. MOUNT PEDESTRIAN SIGNALS 9'-3"  $\pm$  6" FROM CONCRETE LANDING TO BOTTOM OF HOUSING.
2. MOUNT PUSH BUTTONS 42"  $\pm$  2" ABOVE CONCRETE LANDING. SEE STD DWG GW 5A, 5B, AND 5C FOR LANDING DETAILS.
3. PLACE PUSH BUTTON AND PEDESTRIAN SIGNAL WITHIN TEN FEET OF THE FRONT OF DETECTABLE WARNING SURFACE, MEASURED FROM THE CENTER OF THE CURB CUT.
4. WHEN USING PEDESTRIAN POLES FOR PUSH BUTTONS AND PEDESTRIAN SIGNALS, USE ONE POLE FOR EACH DIRECTION OF TRAVEL. TWO 9" x 12" SIGN FRAMES WILL NOT FIT ON ONE PEDESTRIAN POLE.

UTAH DEPARTMENT OF TRANSPORTATION  
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION  
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL  
CHAIRMAN STANDARDS COMMITTEE  
APPROVED  
DEPUTY DIRECTOR

PEDESTRIAN  
SIGNAL ASSEMBLY

STD DWG  
SL 9

REVISIONS  
1 12/18/03 LM ENTIRE DRAWING MODIFIED.

REMARKS

NO.

DATE

APPR.

DATE

DATE

STANDARD DRAWING TITLE

## Standards Committee Submittal Sheet

Name of preparer: John Leonard, Todd Richins, Glenn Schulte, Chris Cowan, Phil Pool, Justin Jar, Stan Burns

Title/Position of preparer: Region 2 Maintenance, Traffic & Safety, Project Development

Specification/Drawing/Item Title: Retrofit Plate for Wire Loop Barrier

Specification/Drawing Number: \_\_\_\_\_

### Enter appropriate priority level:

(See last page for explanation)

3

Sheet not required on editorial or minor changes to standards. Check with Standards Section.

### NOTES:

1. All Submittal Sheets must be completed and sent to the Standards and Specifications Section by the Standards Committee suspense date as shown on the Web.  
(<http://www.udot.utah.gov/index.php/m=c/tid=303>)
2. The Preparer of the Submittal Sheet or the Standards Committee member (or authorized substitute) responsible for the submittal must be present at the Standards Committee meeting and capable of discussing and answering all questions related to the submittal. The item will be postponed to a later meeting if one of these people is not present.
3. Notify the Standards and Specifications Section immediately of any changes that impact the presentation to include absence of sponsor or delay in presentation.

Complete the following: (Use additional pages as needed.)

- A. Why? Detail the reason for changing the Standard (Specification or Drawing), what has initiated a new Standard, or what has caused a new or changed item of interest.

The Group (John Leonard, Glenn Schulte, Todd Richins, Justin Jar, Phil Pool, Chris Cowan and Stan Burns) was asked to develop possible solutions for the Department's deteriorating wire loop Jersey barrier. The Group investigated about a dozen options and fabricated 5 of those options at Station 244.

We are proposing to retrofit existing wire loop barrier with a 4 bolt, 2 - 1/2" x 8" x 24" steel plates.

This is not a request to change an existing Standard Drawing (BA IA) but to add a standard detail sheet to all projects (Blue and Purple) that have existing Jersey barrier connected by wire loops.

Previous standard drawings from the 1970s until 2001 allowed steel bar, plate or wire loops to connect Jersey barrier. The wire loop connectors have begun to deteriorate from rusting and have the potential to fail under impact.

The group looked at 12 different possible solutions. Of the 12, the group developed prototypes for 5 of the most promising ideas. They included single and double steel plate with through bolt connections, anchor and epoxy bolted steel plate, bent and welded rebar connections.

- B. How is Measurement and Payment handled? Existing (from the measurement and payment document), modified, or new measurement and payment to be included with all Standard Specifications or Supplemental Specifications.

Department Special Provision needed for all Blue and Purple Book projects that include Jersey barrier with wire loop connection. We propose that the retrofit connection be paid by "each." All labor, equipment and material to be included.

- C. Stakeholder Notification for AGC and ACEC:

By email provide the AGC and ACEC Standards Committee member a copy of all pertinent information relating to the specification or drawing. Detail all responses below. Indicate if no comments were received.

Note: There is a two-week response time set for this item.

Refer to the Standards Committee Web site, Members page at <http://www.udot.utah.gov/index.php/m=c/tid=659> for the respective e-mail addresses.

AGC Comments: (Use as much space as necessary.)

Submittal Sheet sent to:

Mont Wilson, Granite Construction

[mont.wilson@gcinc.com](mailto:mont.wilson@gcinc.com)

No Comments Received

ACEC Comments: (Use as much space as necessary.)

Submittal Sheet sent to:

Tyler Yorgason, CIVIL SCIENCE

[tyorgason@civilscience.com](mailto:tyorgason@civilscience.com)

No Comments Received

- D. Stakeholders? From the list provided, document the stakeholders contacted, detailing: the company, name of contact, how contacted (by phone, email, hard copy, or in person), concerns, and comments of the change. Stakeholders:

Note: There is a two-week response time set for this item. Allow Stakeholders two weeks to process and respond to coordination requests. All areas should try to complete review and comment as soon as possible but within two weeks.

In-house (for example, preconstruction, materials, construction, safety, design, maintenance) (Include all applicable in-house areas even if not listed above.)

Information sent to all Region District Engineers: No Comments Received

Contractors (Any additional contacts beyond "C" above.)

As stated above the team developed several different designs. The group used Region 2's Sign and Guardrail Station to determine the ease of fabrication in the field. We hired ACore to construct these prototypes.

Suppliers NA

Consultants (as required) (Any additional contacts beyond "C" above.) NA

FHWA (To be accomplished as part of the two-week process before submitting to the Standards and Specifications Section for inclusion on the Standards Committee agenda.) (This is in addition to the requirements of UDOT Policy 08A5-1, procedure 08A5-1.3.)

We contacted one current and one former FHWA representative from the Washington DC Office. We also contacted Roland Stanger of the Utah Division. No Comments Received from Utah Division

[Richard.Powers@dot.gov](mailto:Richard.Powers@dot.gov)> 11/6/2006 9:45 AM >>>

I'm still working on the PCB question. I'd say the retrofit plate is better than nothing, but would hope all new barrier would be a 350 design (triple-loop configuration preferred - at least by me) and that the existing wire rope looped ones wear out soon. When Idaho tested their wire rope design, the impacted barrier segment leaned back, but the adjacent downstream segment didn't so the pickup climbed up and over the test installation. If your steel plates allow both segments to rotate together, they should work OK. As per Bill's comment, the holes in the plate should be spread out and I'd suggest they be in a diagonal plane rather than a vertical one. Bolt heads on the traffic side should be nearly flush with the plate; backside doesn't matter 'cept for a median barrier. Silican should be silicon?

William Fitzgerald <travellingfitz2@yahoo.com>

I like it, but JUST TWO COMMENTS:

1. Although the pate can easily be drilled to the dimensions shown, I'm a little concerned about the holes to be drilled in the barrier. Even with a jig, 1 1/2" holes that are 3" on center leaves only 1 1/2" of concrete between - if perfect. I would spread the holes apart a little more.
2. Nit-picky: second installation note "bold" should be "bolt," and 1 is singular (for flat washer) The photo of the installation looks a lot better than those pieces of rotted rope you showed me before. In many cases you are going to get some contribution to shear and tension from what's left of the original design. But why did the structural analysis use a 20 degree angle rather than the 25 degree angle of the standard testing?

Others (as appropriate)

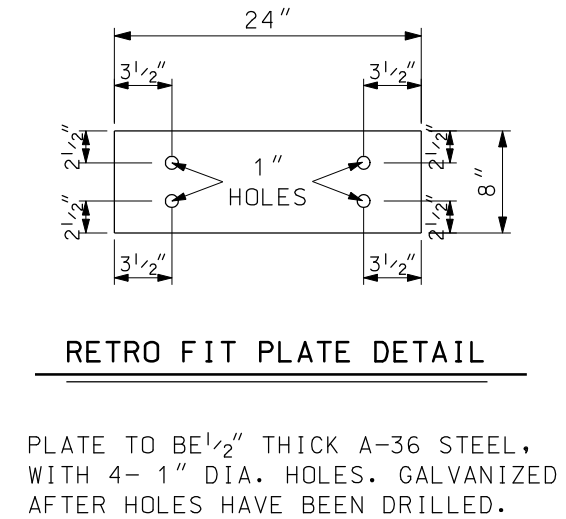
- E. Other impacted areas, systems, or personnel. (Consider all impacts and possible changes to these areas during the preparation process. Coordinate with all appropriate areas for the respective item. List all impacts and action taken.)
1. Minimum Sampling and Testing Guide (MS&T Guide)  
Certifications will be required for steel plate and bolts
  2. Business Systems (Electronic Bid System, Project Development Business System, Electronic Program Management, Computer-Aided Drafting and Design, etc.)  
Electronic Bid System – Measurement and Payment item required  
Electronic Program Management – No change required  
Computer-Aided Drafting – CADD detail completed
  3. Implementation Plan (Provide detailed instructions on how the subject item will be implemented to include notification of all interested parties and training requirements.)  
Implemented in all blue and purple book projects.
- F. Costs? (Estimates are acceptable.) See attached spreadsheet
1. Additional costs to average bid item price.
  2. Operational (For example, maintenance, materials, equipment, labor, administrative, programming).
  3. Life cycle cost.
- G. Benefits? (Provide details that can be used to complete a Cost – Benefit Analysis.)  
(Estimates are acceptable.) (If no costs, what is the benefit of making this change?)
- Cost and benefits were analyzed on 6 of the retrofit proposals and all new barrier. Material and labor costs were estimated. Pros and cons were identified for all 6 designs. Total costs to retrofit or replace were estimated (see attached spreadsheet).
- H. Safety Impacts?  
Jersey barrier retrofit will help maintain the integrity of the system.
- I. History? Address issues relating to the current usage of the item and past reviews, approvals, and/or disapprovals.  
Previous standard drawings 1970s until 2001, allowed the use of steel bar, plate or wire loops to connect Jersey barrier. The wire loop connections have begun to deteriorate from rusting and have the potential to fail under impact.  
The Standard Specs were changed in 2001. The only connection allowed today is ¾” steel bar.  
Several recent vehicle impacts have called into question the integrity of the wire loop connection.

## Priority Explanation

Enter the appropriate priority in the box on the first page of the document.

- |            |   |
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New Barrier					
Cost Estimate Comparison					
Barrier Size	Cost	Disposal Fee	Total Cost	Number Barrier	Project Cost
12.5 ft	\$400	\$200	\$600	100,000	\$60,000,000
20ft	\$600	\$300	\$900	62,500	\$56,250,000
Assume 100,000 joints@ 12.5ft = 1,250,000 ft					



TRIM BOLT END AFTER INSTALLATION  
TO A MAXIMUM OF 1/4 INCH PROTRUSION  
FROM THE TOP OF THE LOCK NUT.  
TRIMMING TO BE DONE BY MECHANICAL  
MEANS ONLY. COLD GALVANIZE EXPOSED  
END AFTER TRIMMING. (TORCH NOT ALLOWED).

ALL COMPONENTS TO BE TO BE GALVANIZED.

RETRO FIT PLATE FOR WIRE LOOP BARRIER	UTAH DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION SALT LAKE CITY, UTAH										REVISIONS					
	RECOMMENDED FOR APPROVAL															
	CHAIRMAN STANDARDS COMMITTEE															
	APPROVED															
	DEPUTY DIRECTOR															



## **Action Item Update for February 22, 2007 Standards Committee Meeting**

(As of February 6, 2007)

**Item 1, Rumble Strips:** New target date was set to February 2007 meeting during the November 2006 meeting. Scheduled on the agenda for approval of Supplemental Drawings PV 8 and to update the Committee and bring the policy into line with current Standard Drawings.

**Item 2, New Drawing of Three-legged and Four-Legged Intersection:** New target date was set to February 2007 meeting during the November 2006 meeting. Scheduled on the agenda. The drawings have been developed and out for coordination. Not ready.

**Item 3, Supplemental Specification 01554M, Traffic Control:** New target date was set to February 2007 meeting during the November 2006 meeting. Scheduled on the agenda. Also now being tracked as 01554, not 00555. Not ready.

**Item 4, Review of Standard Sheets 1B and 1C, Index.** Decision was that the sheets are no longer needed. A listing of all Standard Drawings with approval date are now included in all Project Table of Contents (TOC) files with the all parts of the TOC updated accordingly. Drawing changes will now be issued by Supplemental Drawing, similar to the issue of Supplemental Specifications. Procedures and the Web site have been updated. Supplemental Drawings that impact a project are now included in the Plan Sets (full size plan sheet projects) or TOC (8 ½ x 11 projects) by the designer. For the full size projects the drawings are added at the end of the Plan Set. For the other size projects the drawings are added after the Typical Sections or Detail Sheets. A hard copy book was also published with all approved changes through the November 2006 meeting included. An effective date of February 1, 2007 is in effect with a Priority 3 requiring the use of the new procedures after February 28. This item is now closed.

**Item 5, Supplemental Specification 02765, Pavement Marking Paint:** The item was due for the November 2006 meeting but was not ready. The target date was changed to the February 2007 meeting. On agenda for approval.

**Item 6, Supplemental Specification 02843, Crash Cushion:** New item following the November 2006 meeting. On agenda for approval.

**End of Agenda Package**